

Mr. Schell. die 1784. 8^s

A
HISTORY
OF THE
MATERIA
MEDICA.

CONTAINING

Descriptions of all the Substances used in Medicine; their Origin, their Characters when in Perfection, the Signs of their Decay, their Chymical Analysis, and an Account of their Virtues, and of the several Preparations from them now used in the Shops.

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L O N D O N:

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MDCCLI.

T O

Doctor MEAD.

S I R,

THE World will say I have a good Opinion of this Performance, when I venture to dedicate it to the greatest Judge we know of the Subject: I should blush to be found in the Wrong in this, but if it be otherwise, to whom can I so properly address it?

While the Name of Dr. MEAD was never given as a Sanction to a bad Book, nor ever refused perhaps to a good one, it must stamp a Value upon whatever appears under its Countenance, and Protection, greater than the Applause it insures from the rest of the World; and which will remain as long as it is remember'd that the Science of Medicine flourish'd in ENGLAND at this Period.

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That

DEDICATION.

That you may yet many Years continue to support the Dignity of that Profession, you have so long been an Ornament to, is of the Number of the sincerest Prayers of all who have the Prosperity and Honour of it at Heart, but of none more than of him who is happy in this Opportunity of telling the World with how great Respect and Esteem he is,

S I R,

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Your very obliged,

and very obedient humble Servant,

John Hill.

T H E P R E F A C E.

T H E Subjects of the Materia Medica are all of them the proper Objects of Natural History: 'Tis from that Science alone therefore that a perfect Knowledge of their Nature, Origin, and Formation is to be obtain'd.

They are also the Objects, and indeed the sole Objects of Chemistry; and it is by the Assistance of that Science only, that we can attain to an Acquaintance with their more intimate Compages, their Principles, the Proportions of these, and the Laws of their Union; and consequently of their Properties and Virtues, since it is on these that they solely depend.

It will appear from this, that whoever would write advantageously on the Materia Medica, must be first acquainted with those Branches of Knowledge; and it will appear also on Examination, that of the Number who have attempted it, the greater Part have failed merely through a Deficiency in one or the other of them.

It is an idle Supposition to set out upon, that there are the Works of good Chemists, and of good Naturalists extant, and that from those a sufficient System of Information

on this important Head may be compiled: to compile with Judgment, requires as much Knowledge of the Subject as to write well on it: No Man is qualified to execute this to Advantage, who is not able to have written what he borrows, and he who can do that, will hardly condescend to the other. Even the best and most authentick Books on these Subjects have their Errors, most of them too many; and while he who is himself deficient in the Knowledge of the Subject, cannot but be liable to take in these with the rest, it is evident what Sort of Dependance ought to be placed on his Collections.

A Man is hardly qualified to write on any Subject, who has not read every thing that has been well written on it; but even if he has done this, he is still qualified for nothing farther than retailing to the World the Discoveries of others, unless he add to his reading an Examination of the Bodies themselves, and an Investigation of their several Qualities and Properties under his own Eye. On a Foundation like this he will be qualified to instruct every one who has not been at the same Pains on the Subject; he will know the real Merit of the Writings of others, by having brought them to the Test of Nature and his own Experiments, and will consequently know what of his private Observations deserve the Name of Discoveries or Improvements; and what of the Accounts of others will bear Quotation or Adoption.

I would not claim much Merit on the having read what has been written on this Subject before; nor be ashamed of owning that while I have rejected every Assertion, even of the greatest Writer, that has not agreed with Truth and Experiment, I have adopted every material one that I found really do so. The principal Value of this Work, such as
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it is, will be, that the descriptive Part is founded on a closer Examination of the Bodies themselves, than any Author else seems to have had the Attention to bestow on them; and the Analytick on such a Number of Experiments as People of a less inquisitive Turn would never have had the Patience or Industry to go through.

I am never so happy as when my own Observations and Experiments agree in the Result with those of other Original Writers; but as Truth can be but one Thing, I have never scrupled to depart from the joint Testimony of the whole Series of Authors, when repeated Experiments have confirmed me in what is differently asserted. The Analysis of Vegetables made by the French Chemists, and recorded in the Memoirs of the Paris Academy of Sciences, in the Treatise of Geoffroy on this Subject, and in some separate Works in that Language, agree in most Cases so nearly with mine as to do Honour to both; where they differ very widely, I have always repeated the Experiments, that I might advance nothing rashly; and am apt to believe, that in many of these Cases the Fault has rather been in the Printers, than in the Authors of those Works.

Of the three Branches of Natural History, Botany has been of the late Ages greatly the most cultivated, and in Consequence of this the Vegetable Part of the Materia Medica has been the most largely and the most advantageously treated of, tho' there are yet many Deficiencies even in that.

Mineralogy and Zoology have been less improved by modern Discoveries, and in Consequence of this, they have been less accurately treated of by the Writers on this Subject: that they are more largely explained here, is owing
to

to a Series of Experiments and Observations, the Result of which is the being able to speak with Certainty of a Multitude of Things that were but guess'd at, some right, some wrong, before.

The Merit of the Work its Author is the last Person in the World to judge of, but while I am conscious that I have done every Thing I could to give it some, and that this is considerably more than others have been either able or willing to go through on the same Subject, I shall be easier as to the Consequence, than if I had written so much upon a worse Foundation.



O F T H E
M A T E R I A M E D I C A
I n G E N E R A L.

UNDER the Term *Materia Medica*, are comprehended all those Bodies which are either used in Medicine in their natural State, or afford Preparations that are so.

These Bodies belong partly to the *fossile*, partly to the *vegetable*, and partly to the *animal Kingdom*: A general History of them is therefore naturally divided into Three Parts ; in each of which the several Subjects belonging to one of these three Kingdoms are treated of.

As the Number of Bodies comprehended under these general Distinctions, is considerably great, it will be convenient to arrange those belonging to each of them into several Classes, under such Denominations as are familiar and obvious, and will naturally point out the Place, where the Subject may be expected to be found.

THE
HISTORY
OF THE

Materia Medica.

PART the FIRST.

Of the Bodies used in Medicine belonging to the Fossile Kingdom.

BY the Word *Fossil*, us'd as a Denomination of one of the three general Divisions of natural Productions, we understand Bodies form'd usually within the Earth, sometimes on its Surface, and sometimes in Waters; Of a plain and simple Structure, in which there is no visible Difference of Parts, no Distinction of Vessels and their Contents, but every Portion of which is similar to, and perfect as the Whole.

These consider'd as Subjects of the *Materia Medica*, are naturally divided into Eight Classes; which, arrang'd according to the Importance they are of to Medicine, will stand in the following Order.

Class the First, METALS, with their several Ores.

Class the Second, SEMIMETALS, with their RECREMENTS.

Class the Third, SIMPLE SALTS.

Class the Fourth, METALLICK SALTS, or VITRIOLS, with the VITRIOLICK MINERALS.

Class the Fifth, INFLAMMABLE FOSSILS. *Sulphurs, Bitumens, &c.*

Class the Sixth, EARTHS.

Class the Seventh, STONES.

Class the Eighth, EXTRANEOUS FOSSILS, Bodies originally belonging to the animal, or vegetable Kingdom, but petrefied or otherwise alter'd by long lying in the Earth.

To the Bodies of these Eight Classes, when we have added the *Waters* impregnated with the Particles of one or other of them, taken up in their Passage through the Earth, we shall have before us all the Subjects which the *fossile* Kingdom furnishes the *Materia Medica* with.

F O S S I L E B O D I E S

Used in M E D I C I N E.

C L A S S the F I R S T.

M E T A L S.

AMONG the several Bodies which the *fossile* Kingdom supplies the *Materia Medica* with, the *Metals*, though less numerous than those of many other of its Classes, claim the Precedence in a Work in which they are to be treated of as Medicines, since they are far more powerful ones than those of any other Class, and furnish the Shops with a much greater Number of Preparations, than those of all the rest together.

We understand by the Term *Metal*, a firm, heavy, and hard Substance, opaque, fusible by Fire, and concreting again when cold into a solid Body such as it was before, which is malleable under the Hammer, and is of a bright, glossy, or glittering Surface where newly cut, or broken.

The Class of the Metals, according to these Characteristicks, includes only six Bodies, which are, 1. Gold. 2. Silver. 3. Copper. 4. Tin. 5. Iron. And 6. Lead.

The Weight of the Metals is one of their great distinguishing Characters from all other Substances ; and it serves also by means of the hydrostatical Balance, by which their specific Gravities are accurately determined, to distinguish them even in Mixture with one another, in a Manner that no other Means could come up to.

In regard to the relative Gravity of the *Metals* to one another, Gold is the most heavy of all ; Lead is the second in Weight ; then comes Silver ; and after this Copper ; Iron is the lightest of all, except Tin.

The Chemists have divided the *Metals* into two Classes, the perfect and the imperfect : Gold and Silver only they allow to be of the first Class, as losing nothing of their Weight, nor receiving any Alteration in the Fire ; the other four, as they want this Quality of resisting the Force of a violent Heat, they call imperfect : As this however is a Distinction less obvious, perhaps also less essential than that of their specific Gravities, it deserves no great Attention.

In a Work of this Kind, where the *Metals* are consider'd as Medicines, their Weight, Perfection, and Price are all of less Consequence than their Virtues : Arranging them according to these, they will naturally fall into the following Order.

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| 1. IRON. | 3. COPPER. | 5. TIN. |
| 2. LEAD. | 4. SILVER. | 6. GOLD. |

CHAPTER I.

F E R R U M,

Iron.

IT has pleased the beneficent Creator of all Things, to make this Metal common to all Parts of the World, and plentiful in most : For this Reason it is happily of small Price ; but if we look upon it with an Eye to its Utility, either in the common Affairs of Life, or in Medicine, it is found to be greatly superior in real Value to the dearest of the others.

Iron is the least heavy of all the Metals, except Tin : But though almost the lightest, it is considerably the hardest of them all. It is, when pure, naturally malleable and ductile under the Hammer, but that in a less Degree than either Gold, Silver, Lead, or Copper ; when wrought into Steel, or when in the impure State from its first Fusion, in which it is called *Cast Iron*, it is scarce malleable at all : The most ductile Iron in the World also, on being only heated and suddenly quenched in cold Water, loses much of this Quality.

Iron is extremely capable of Rust ; more so indeed than any other Metal : It is very sonorous : It requires the strongest Fire of all the Metals to melt it ; it must be a very good Furnace that will make Iron run without the Blast of Bellows ; but it is found that when once heated to a proper Degree, this Blast alone will effect that without the Assistance of the farther Heat of any Fuel being employed in it ; for if an iron Bullet, made red hot, be suspended at a Distance from the Fire, and the Blast of a strong Pair of Bellows forcibly directed against it in that Condition, it will in a little Time melt and run down in Drops, by the mere Effect of the Current of Air they convey to it.

Iron is less simple in its Composition than any of the heavier Metals : It contains indeed a Sulphur so imperfectly blended with the rest of its constituent Matter, that it will readily get loose from it, and in a strong Heat will appear in visible Flames.

It is the most difficultly of all the Metals amalgamated with Mercury, the metallurgick Authors in general have said that it will not amalgamate with it at all ; but from the Success of some late Attempts towards making this Union between them, it appears to be not impossible that a Method may be found of doing it.

Iron is less fixed in the Fire than most of the other Metals ; it manifestly fumes and sparkles when exposed to a moderately fierce Degree of it ; it loses also a Part of its Weight in this Heat, and much more when in Fusion.

Iron is remarkable for the Effect Fire has on it, in rendering it more ductile ; most of the other Metals are brittle while they are hot, but this is most of all malleable, as it approaches nearest to Fusion. It grows red hot long before it melts, and is known to be approaching toward that State, by its becoming whiter, and by its sparkling : If taken from the Fire as soon as it runs, it is found to be the more malleable for the Fusion ; but if it be kept long in that State, its Sulphur dissipates in Form of a white Smoak ; the
Metal

Metal after this becomes much more brittle, and in fine runs into a bluish Glass.

Iron exposed to the Focus of a great Burning-Glass, instantly grows red hot, then turns whitish, sparkles and flames, and immediately after melts; soon after this the greatest Part of it flies off in Sparks, which appear very bright, and if caught upon a Paper, are found to be so many little regular globular Bodies, all hollow, like Bomb Shells: The Remainder runs into a bluish or purplish Glass; and this Glass exposed again to the same Focus on a Piece of Charcoal, takes up from that vegetable Fuel, the Sulphur or inflammable Principle it had lost, and becomes true Iron again.

Upon the whole, the Effects of a common, and those of the Solar Fire on this Body, concur to prove that it consists of a vitriolick Salt, a vitrifiable Earth, and a peculiar bituminous Matter, not found in any of the other Metals.

The specific Gravity of Iron has been laid down by Authors to be, as from 6960 to 8806 to 1000 to that of Water. The purest and most perfect Iron I have been able to procure, is, according to the Trials I have made, to Water as 7632 to 1000, that is, a little more than as seven and a half to one. Iron is attracted by the Loadstone, and is the only known Substance that is so. When perfectly pure it melts readily with Gold, and Silver, and unites with them in Fusion; but if it be impure, it separates itself and forms a distinct Regulus above the Surface of the other.

On being heated red hot it increases in Bulk and in Weight; but it returns to its former Gravity and Dimensions when cold.

Iron is soluble in all the stronger Acids; Spirit of Nitre, or Aqua Fortis, succeed most readily in the Solution of it; but beside these and all the other Acids, it is to be dissolved also by a Multitude of weaker Menstruums, among the rest, even by common Water; for on lying long in this Fluid, it communicates a manifest Taste to it, and contracts a Rust, and throws off a yellow Ochre. All Salts, except the alkaline ones, readily dissolve Iron; nay the very Air has so much Power over it in this respect, that the People who deal in Utensils made of it, are obliged to cover them with some oily or fat Substance, to make them retain their Polish.

To this it may be added, that Iron is the most easily of all Metals destroyed by many other Means: It neither resists the Force of Lead, nor of Antimony; but on being fused with them, it almost immediately vitrifies, and is carried off in Form of Scorïæ.

The great Test of Iron is, its answering to, or being attracted by the Magnet. We find however, that Iron must necessarily be in its true metal-line State, in order to its coming up to this Test, for many of the Ores in which there is a very great Quantity of this Metal, penetrated by Sulphurs and other Bodies, will not answer in any Part to this Trial.

According to even so rigid a Test as this of the Magnet it appears, that Iron may be produced by Art, out of Substances, in which we should naturally have no Idea of finding it; nay out of almost every Thing we know. Earths of almost all Kinds afford Iron by Calcination, and all the Parts of Animals and Vegetables, as well their Fluids as their Solids, yield it by the same Means; if any Plant, or Part, or Juice of a Plant be burnt to Ashes, or the Flesh, Bones,

Bones, Blood, or Fat of any Animal, be treated in the same Manner ; Iron will be found in the Ashes, and that in so perfect a State, that it answers readily to the Magnet. Honey, Wax, and all the other vegetable Substances, collected by Animals, contain Iron ; and it may be separated from them pure in the same Manner : Finally our Dr. *Lifter* takes great Pains to prove, that this Metal is found in, nay and is the Basis of, the Stone in the Bladder.

Iron in the Bowels of the Earth, when it enters the Composition of Crystals and Spars, sometimes determines their Figure ; at others, it only affects their Colour : In the former Case it gives them a rhomboidal Form, in the latter it tinges them red or purple.

It is singular, that the affecting the Colour and the Shape of Crystals and Spars, seem to be two very different Operations of the same Metal ; they sometimes indeed concur, as there are found purple rhombic Crystals of Iron, and yellow cubic ones of Lead ; but in general it is much more frequent to see colour'd hexangular Sprigs, and colourless Cubes, and Rhombs. Among the Gemms, the Amethyst, Garnet, and Hyacinth, owe their Colours to Iron, and this Metal has the same Effect in the Preparation of the factitious Gemms, as in the natural ones ; for, properly managed, it communicates a purple or a red Colour in various Shades and Degrees to Glasses, and to vitrified Substances of all Kinds.

The Ores of Iron are extremely various in their Form and Colour. Pure native Iron has been found in some Places. There is scarce a Mineralist indeed, but has something under this Name in his Cabinet, or an Author, but mentions the having met with it : We are not to suppose however, that it has been the Fortune of all these Gentlemen, to see so uncommon a Fossil ; a Specimen purchas'd unseen for me in *Germany* some Time since, under a very pompous Name, and at a considerable Price, when it arrived in *England*, proved to be no more than the broken Point of one of the iron Picks, used by the Miners, to separate the Masses of Ore in the Loads : It is but too probable from the real Scarcity of this Fossil, and its pretended Frequency in Cabinets, that what is preserved in most of them under its Name, is either absolute wrought Iron like this, or is unmalleable, and therefore not true native Iron ; some People having a Way of calling by this Name, those Parts of the rich iron Ores, which though not malleable will answer to the Magnet.

True native Iron is not to be expected in the midst of Masses of its Ore, but in detached Sprigs or Filaments in the Fissures of Rocks, the whole Substance of which is rich in that Metal : Such have been all the genuine Specimens of this scarce Fossil, and such their Place of Formation.

The Ores of Iron generally discover themselves to be such, either by their Resemblance to wrought Iron in Structure and Look, or by the yellowish or purplish Tinge they are coloured with. Those which have most of all the Appearance of the Metal they contain, are usually the richest.

There is an iron Ore found in *Sweden* and *Germany*, particularly in the *Harts Forest*, which usually lies in the largest Fissures of the Strata, in great Lumps, and is very hard, heavy, and of a bluish grey Colour ; this, when broken, has so much of the sparkling Appearance of the Metal, that a Person unaccustomed to these Subjects, might easily mistake it for real pure Iron. This is the richest Iron Ore known, unless we except some of the *Hæmatites*.

We have an Ore very like this in the Forest of *Dean*, in *Gloucestershire*, which is at this Time worked to great Advantage. Another Kind we have in *Derbyshire*, which is also common to *Sweden* and to *Germany*; it resembles the former, but that it is harder; and when broken, is not so bright and sparkling. There are also other very rich Ores, of a dusky brown Colour, with a Tinge of Purple; of this Kind are those worked at this Time in *Sussex*, under the Name of the *Cabala Vein*. Another of the rich Kinds less common with us, is of a blackish Purple, with a few bright Spangles in it, but this is much inferior to the two former of those above-mentioned.

The poorer Ores of Iron are generally of a more lax and friable Texture, and of a yellowish or reddish Hue, or else of a mixed Colour between these, and with a Cast of brownish or blackish in it: But the most singular of all the Ores of Iron, is a white one, which appears only like a debas'd Crystal, having not the least Sign of any Metal in it. The common Ochres, as well the yellow as the red, are also to be ranked among the Number of the Ores of Iron; they are very rich in that Metal, and are even worked for it in some Places to great Advantage: Nor are we to omit the Mention of those elegant Bodies which hang from the Roofs of Caverns in Iron Mines, in Form of Icicles. These are truly Stalactites of Iron, they are generally produced in large Clusters together, and are called by the Miners, *Brush Ore*; these are almost all Iron: I have produced from some of them six Drams and a half of that Metal from the Ounce.

The crusted ferrugineous Bodies, common in our Gravel Pits, about *London*, are also very rich in Iron, and have been worked for it in Places where they are sufficiently plentiful. I have procured from some of these, pick'd up near *Kensington* Gravel Pits, full one Third of their Weight, in pure Iron. The red Substance, called *Smit*, is likewise a very rich Iron Ore; this is much like the common *Derbyshire Reddle*, but finer and heavier.

To compleat the List of the Ores of this Metal, there are to be added to these, four other Substances of the mineral Kingdom, which tho' no more than true iron Ores, have been distinguished by Authors under particular Names, and therefore will be expected to be found under them in this Work. These are, 1. The Magnet, or Loadstone. 2. The Blood-stone, or Lapis Hæmatites. 3. The Smiris, or Emery: And 4. That variable Substance, *Magnesia*, or Manganese, of which, what the *French* call the Perigord Stone, or Lapis Petracorius, is a Kind.

M A G N E S, *The Loadstone.*

The Loadstone is a peculiar Ore of Iron, and is so rich a one, that such Pieces of it as are not worth preserving for their magnetic Virtue, are wrought with much Profit for the Metal they contain. It is found in large Masses of a deep Iron grey, where fresh broken, and often tinged with a brownish or reddish Colour. It is very heavy, and considerably hard, of a compact and dense Structure in general; but in some Specimens, full of little Cavities, in particular Places. Struck against a Piece of Steel, it readily gives Fire, and when pure from foreign Mixtures, it will not ferment with any of the acid Menstrua. Its great Character however, of affecting Iron, will in general serve to distinguish it sufficiently; these other subordinate

nate ones are only of use where that is not strong enough readily to manifest itself. This Ore of Iron is found in *England*, and in most other Places where there are Mines of that Metal; but the Specimens of it which have any great Degree of magnetic Power are scarce. I have separated from ordinary Pieces of the Magnet very near three Fourths of its Weight in pure Iron.

The Ancients called this Ore of Iron *Heraclius*, and *Lydius Lapis*. By the Word *Magnes*, now used as the common Name for it, they originally meant a very different Substance which *Theophrastus* has described as white, shining, and of a poisonous Nature. Some of the Writers of the middle Ages have, from a mistaken Translation of this Author, been induced to tell the World that the *Loadstone* was poisonous. It is doubtless possessed of the same Virtues with the other Ores of Iron, but it has not of late been brought into Use internally, though externally it has been made an Ingredient in some Plaisters.

The Ancients indeed are so far from having accounted their *Lapis Heraclius* poisonous, that they gave it inwardly. *Galen* ascribes a purgative Quality to it, and recommends it in Dropsies; and *Dioscorides* prescribes it as a good Medicine to evacuate gross melancholic Humors.

LAPIS HÆMATITES,
Blood-stone.

We are to distinguish carefully between two very different Species of Fossils, called by the common *English* Name Blood-stone; the one is a semi-pellucid Gem, of a green Colour, spotted with red, and is properly called the Heliotrope; the other is a mere Ore of Iron, and a very rich one. The last of these is the Substance to be described in this Place.

It is a very ponderous Fossil, sometimes of a paler, sometimes of a deeper Red, and not unfrequently bluish; it is sometimes found in large irregular Masses, but more frequently in flat Pieces, with botryoide Surfaces, or in the Fragments of such, which, as these Masses naturally break at the Joinings of the Protuberances that form the Surface, are usually rounded at the End, and of a somewhat conic or pyramidal Figure. These Masses are of a naturally smooth and glossy Surface, and when broken are found to be composed of a Number of Crusts laid evenly over one another, and of a regularly striated Texture: As these Crusts are gradually smaller and smaller within the Mass, and the Striæ all converge toward a Center at the Base of each of them, it is not wonderful that they should naturally separate on breaking into Pieces, of a pyramidal or conic Figure.

This Kind of Iron Ore is very various in its Degree of Purity and Hardness, as well as in its Figure. The finest Masses of all are those whose Surface terminates in Bubbles or round Protuberances; the coarsest Pieces have nothing of this Structure, but are composed of larger Striæ, and easily split longitudinally according to them: These Pieces are what the Ancients called by a distinct Name *Schistus*. There is also a yet more impure Kind, which is scarcely at all either botryoide on the Surface, or striated, but yet is truly of the same Kind with the rest, and is not inferior to them in Virtue. The Hæmatites of all these three Kinds is found in *England*, and in great Abundance also in

the *German* Mines, where Masses of it are sometimes met with quite black and of an elegant Polish; and others covered with golden Armature, as high and elegant as if of absolute leaf Gold, laid on in the common Way of gilding. Blood-stone is to be chosen for medicinal Use the highest colour'd and most like Cinnabar that can be had; and such as is heaviest and form'd with the finest Striæ. It is accounted astringent and desiccative. It is given in Powder, from ten Grains to five and twenty for a Dose in Hæmorrhages, and is used in Distemperatures of the Eyes.

S M I R I S,

Emery.

This is an Iron Ore, easily distinguished from all the others, by its peculiar Hardness. It is found in Masses of no determinate Size or Figure: It is usually of a dusky brownish Colour on the Surface, and often has with that some Cast of Reddishness: When broken it looks more of an iron Colour. It is remarkably heavy, and is generally spangled all over with thin glittering Particles; these are Fragments of a Kind of foliaceous Talk very highly impregnated with Iron. There is some Emery which is not only reddish on the Surface, but has a very strong Tinge of that Colour throughout; this is generally supposed to be rich in Gold, but this Colour is not always to be supposed a certain Signal of the Presence of that Metal; I have indeed obtained Gold in no less Quantity than thirty three Grains from the Ounce of some of this Emery; but I have worked other Pieces that look'd as promising, with the same or greater Care, and have not been able to obtain a Grain of Gold from them. There are indeed some Masses of this red Emery in which the Gold lies open to the Eye of an accurate Observer in slender Veins, but these are very rare; in the most it is indeed native Gold, but lodg'd in them in too small Particles to be visible.

Emery struck against a Steel gives Fire very readily: It cuts Glass like a Diamond: It makes no Effervescence with any of the acid Menstrua. There is a very great Analogy between the Magnet and this Substance, so much indeed, that it proves the Truth of the Opinion of their being both Iron Ores, not distinct Fossils; there are Loadstones which are not to be distinguished from Emery but by their attractive Power; and there are Pieces of Emery which will attract Iron.

Emery is found in *Sweden*, *Germany*, *Italy*, and *England*, and indeed in many other Places. The Island of *Guernsey* furnishes a great deal of it. The red Kind is sometimes found in the *German* and other Mines, but no where so plentiful as in the gold Mines of *Peru*; but it is very difficult to obtain any of it thence, the Exportation of it being strongly prohibited.

It is said to have an eroding and almost caustick Quality, but we have no good Foundation for such a Censure of it: *Dioscorides* and the rest of the Ancients have recommended it as an Abstergent, and given it great Praises as a Dentifrice, and they tell us that it strengthens the Gums: There is no Doubt of its being capable of cleaning the Teeth better than any other known Substance, but it must be used with great Caution, as its Hardness and Sharpness are such, that it will be apt to wear off the Enamel of them. It is prepared by grinding in Mills, and the Powder is separated into Parcels of different Degrees of Fineness, by washing; these are called the first, second, and third

Sort,

Sort, the first being that which remains longest suspended in Water, the others such as sink sooner from the same Liquor, and from which it is pour'd while yet turbid to settle for the finer Kind. These several Sorts are of great Use to the Lapidaries, who cut the ordinary Gems on their Wheels by Means of sprinkling the wetted Powder over them, and afterwards give them their Polish on other Wheels with Rotten Stone. The Wheels they use for cutting are usually of Lead, with a small Admixture of Pewter; their Softness serving to admit the Emery the better: Those they polish on are usually of Pewter alone, though some use Copper. It will not cut Diamonds at all, but it is of great Use on all the other Occasions, and of constant Service also in the cleaning and polishing of Steel.

The red Emery of *Peru* is in great Esteem with the People who search after the Philosopher's Stone; they talk of a Tincture of it in Spirit of Salt, which they say will fix Mercury. We should not be surpris'd that such a Tincture contained Gold, when made with a Menstruum that has Power to act upon that Metal, and when we know the Ore contains it. The King of *Spain* however does not chuse that these Gentlemen should pursue their Experiments, for he suffers none of it to come over.

MAGNESIA,
Manganese.

This is an Ore of Iron extreamly well known by Name, but scarce known any otherwise by the Generality of the World; the Term *Manganese* having been used by the Glassmen for many different Substances, that have the same Effect of clearing away the foul Colour of their Glass, and the World supposing all the Substances to be truly Manganese, which they have chose to call by that Name. Manganese properly and distinctly speaking is an Ore of Iron less rich than most others in that Metal, and debased by so many adventitious Substances, that it is never worth working for it. It is naturally of a dark iron grey, very heavy, but brittle: It is sometimes of an uniform Structure, but more usually it is composed of a Number of broad and thick Striæ irregularly laid together, and much resembling those of native Antimony; in these Masses it is sometimes reddish, sometimes of a dark grey, and sometimes of a fine pale light grey, approaching to the Colour of the finest polished Iron. Many Specimens of this Kind are preserved in the Cabinets of the Collectors of these Things, under the Name of native Antimony.

There is a less perfect Kind of Manganese, somewhat of the Nature of this, in which the Striæ are almost obliterated in many Places, and in some the Mass seems to consist only of a Number of irregularly figur'd Pieces of a brittle and somewhat glossy Ore, blended very loosely together; this is usually reddish, and breaks with a small Blow. The Manganese that resembles Antimony is a very fine and pure Kind, but is not the finest of all; there is a Sort found in small Quantities greatly superior to it both in Beauty and Value; this is regularly striated throughout, and resembles in Appearance a Piece of the finest Asbestos, except in Colour. It is very friable, and is usually found either in Form of a Crust over other Ores of Iron, or else in thin Cakes, coating over the Sides of perpendicular Fissures of Strata of iron Stone. In this latter Case the Striæ are generally parallel, in the former they are convergent in the Manner of those of the Hæmatites. Beside these
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there is another Kind of Manganese of a very red Colour, usually in Form of Plates or broad Spangles, and another of a pale grey or lead Colour, composed of the same Sort of broad Plates, and often found lodged in a whitish Stone.

These are the proper Varieties of the Appearance of Manganese, which is the same Ore under them all, answers to the Trials by Fire in the same Manner, gives the Assayer the same Degree of Trouble, affords the same Substances on Separation, and contains much the same Quantity of Metal; which in the generality of what I have try'd has not been more than one fifth Part of the Weight of the Ore, when purified so far as to be malleable; for the Iron produced from Manganese is remarkably brittle, and requires uncommon Care and Trouble to bring it to Malleability.

Beside these several Appearances of Manganese however, the Glassmen use for the same Purpose and under the same Name a much richer iron Ore of the grey Kind, and of a regular Structure; though this they acknowledge is apt to colour the Glass instead of clearing it; and a soft red Ore of the Nature of Smit staining the Hands, and full of small Spangles of Talk of the Nature of those in the Emery: The Inaccuracy of the People who send them this Substance occasions their using also many other of the poorer Iron Ores under its Name; and in fine they call every iron Ore that is not too hard or too rich by this common Name of Manganese. The *French* distinguish a Species of this Fossil, under the Name of the *Perigueur*, or *Perigord Stone*, Lapis Petractorius; this is only the coarser and darker Pieces of Manganese. The Potters use this Substance, and the Glassmen the other. The Potters indeed generally expect that their Perigord Stone should be softer than the common Manganese, but there are many Masses of this Ore which would be called by either of these Names, as it happened to fall into the Hands of a Potter, or those of a Glassman.

Manganese is found in great Abundance in the *German* and *Swedish* Mines, as also in *France*, *Italy*, and *England*; but ours is not equal in Beauty or Goodness to the *German* Kind. It is recommended by Authors as an Astringent, and order'd to be given after Calcination in Hæmorrhages; but we have found such Substances separable from it by Fire, as render it very improper for internal Use. It is of great Service to the Glassmen in clearing away the greenish Colour from their white Glass while in Fusion, but when they use some of the richer iron Ores in its Place, they are often distressed by their giving a purplish Colour to the Mass, instead of refining it.

The Ores of various Kinds afford Iron in very different Quantities, and require different Kinds of Management. The more frequent ones are to be roasted and then powdered and washed, and after this roasted again till whatever is volatile is burnt off; they are then to be reduced to Iron by a strong Fire of Wood, which succeeds still better if Turf be mix'd among it. It was a long Time thought that Pit Coal could not be made to serve for this Purpose, but we have lately found the Way of doing it by this Sort of Fuel in two or three Parts of *England*. They usually add Lime or some other Alkali to absorb the too abundant Sulphur of the Ore. Powdered Glass mixed with the common white Flux and a little Charcoal, is an excellent flux Powder for the more stubborn iron Ores. The

The evener the Grain of the Iron is after Fusion, the fairer it promises to become malleable with little Trouble.

The iron Ores in general are very rich in the Metal ; I have separated from the grey Ore first described no less than five Drams of iron from the Ounce. The white crystalline Kind, which is the most singular Substance of all the metalline Ores we are acquainted with, and which has not the Appearance of any Thing metalline about it, I have worked so as to make it yield at the rate of six Drams to the two Ounces. This Ore yields but little Smell of Sulphur in the roasting, and it parts with the Iron tolerably easily. In general it is an almost invariable Thing, that those Ores of Iron which are most offensive to the Smell in the roasting, prove afterwards the most stubborn and troublesome in the working.

The Hæmatites is very rich in Iron ; I have separated nineteen Scruples of Iron from an Ounce of the finer Kinds of it ; and those of the Stalactites of Iron, which are of a glossy Surface, and resemble the Hæmatites in Structure, are almost all Iron. The Emery is so refractory an Ore, that the Iron it contains would not pay the Expence of separating it were it of no other Value ; the utmost I have ever been able to do, has been to procure three Drams from the Ounce of it : But the Manganese is of all the Ores of this Metal the most stubborn, and the least worth the being at any Pains about as an Ore. In general it does not contain one fifth Iron, though this is no certain Rule ; for I have from some of the *German* Manganese, with great Trouble separated more than half Iron, but very brittle, and requiring more Trouble than it was worth to bring it to the State of Malleability. If there be any Ore of this Metal more troublesome to the Assayer, and of less Value than the Manganese, it is that which the *Germans* call *Wolfram* : This has something of the Appearance of Manganese, being striated and externally of a blackish Colour, but red when broken to Pieces ; I only work'd it once : The Piece I assayed did not contain more than one fifth Iron, but an immoderate Quantity of Sulphur and Arsenick, which scented the Place where it was roasted with a Smell of Garlick, that did not go off in a Fortnight. It has been pretended by some, that the Substance called *Flos Ferri*, or Flowers of Iron, contains Iron in it, but I have not been able to separate a single Grain from it. It seems a mere Spar, prettily branched, and has had its Name given not for its being found by any Body to contain that Metal, but merely from its being met with in the Mines of it.

If an Ore is supposed to contain Iron, and it is desired to be try'd whether it do or not, the best Method is to reduce a little of it to fine Powder, and heat it red hot in a Crucible ; then to throw in a little Piece of Suet or Tallow, and let it burn away, to keep the Ore red hot a few Minutes afterwards, and when cool draw a Loadstone, or a Knife, or other Instrument, touched with a Loadstone over the Powder, for the Particles of Iron, if there be any, will then adhere to it ; some of the softer iron Ores will be reduced to a State of answering to the Magnet, only by heating them red hot without any Admixture ; but the harder ones in general require some fat Substance to be added and burnt away upon them.

Steel is made from the purest and softest Iron, by keeping it red hot, stratify'd with Coal-dust and Wood-ashes, or other Substances that abound in

the Phlogiston for several Hours in a close Furnace. It may also be made by Fusion, and several other Ways: But they are greatly in the wrong, who prefer Steel to Iron for medicinal Purposes, be it made in whatever Manner.

All Iron when first separated from its Ore is brittle; it is to be several Times heated, and beat with large Hammers for a long Time together, before it becomes fit for common Use. We hear People speak indeed of naturally soft and malleable Iron as it is run from the Ore, and of other Kinds that are more or less harsh or brittle; but all this is idle and erroneous. The Iron of all the Ores in the World when brought to the same Degree of Purity, by whatever Means that is done, is the same. All that has given Occasion to this Opinion is, that in some Ores there are fewer heterogeneous Matters than in others, or that they are more easily separable from the Metal, for the coming more or less pure from the Ore is all that is meant by these Assertions. All Iron acquires a greater Degree of Hardness and Rigidity on being heated and then quenched in cold Water; but what it acquires this Way is taken off on its being heated to the same Degree again, and left to cool of itself.

Filings of Iron thrown into the Flame of a Candle grow red hot and sparkle very brightly, mix'd with crude Nitre in equal Quantities and thrown into a red hot Crucible, they boil up and emit a copious Fume of a disagreeable Smell, and finally burn away with great Brightness. If Filings of Iron alone are thrown into Spirit of Salt or Oil of Vitriol they make a violent Effervescence, and emit a great Quantity of a sulphureous Flame, which readily takes Fire at the Approach of a Candle, and bursts the Vessels with a violent Explosion: This inflammable Air may be saved in Bladders fix'd on the Necks of the Vessels the Solution is made in. If these are put over in their flaccid State, they will be inflated by the rising Vapour, and if then ty'd up, may be preserved full a great while; and if at any Time prick'd with a Pin, and the included Air press'd out against the Flame of a Candle, it will as readily take Fire as it would have done at first.

The Chemists call Iron *Mars*. The Character by which they express it is this ♂. They mean by this to signify that Iron is Gold at the Bottom, the Circle being the Character of that perfect Metal; only that its upper Part is too sharp, volatile, and as it were corrosive: They suppose that if this superficial and heterogeneous Part of Iron could be taken away, the Remainder would be Gold.

Iron has greater medical Virtues than any of the other Metals, and this is not to be wonder'd at, since of all the Metals it is the only one that is in a Manner soluble in the human Body. Any of the other Metals, whether hard or soft, poisonous or salutary, nay even the fluid Mercury itself swallowed in their crude State, pass out of the Body again unaltered and without taking any Effect; but this is not the Case with Iron, its crude Filings are often taken as a Medicine, and always are so much acted upon by the Juices as to produce considerable Effects. It is so easily work'd upon out of the Body also by Fire, and by different Menstruums, that it becomes an Aperient or an Astringent, as it is differently treated; and is under proper Management, greatly superior to all the Medicines in the World in chronic Cases.

Cases. Its Virtues internally were not unknown to the Ancients. *Dioscorides* attributes an Astringency and Aperientcy both to it, he prescribes it in Hæmorrhages : And recommends its Rust, that is, to call it by a more modern Name, its aperient Crocus in Suppressions of the Menfes, though he on the other hand prescribes Wine, or Water in which red hot Iron had been quenched, as an Astringent in Dysenteries, Diarrhœas, and Weaknesses of the Stomach.

The Ancients therefore, as well as ourselves, were acquainted with this double Virtue of Aperientcy and Astringency in Iron. It seems to act in the human Body principally by means of its vitriolick Salt ; and if we rightly understand the Manner of Operation of that styptick Salt, we shall not be at a Loss to comprehend how a Metal that abounds so with it, acts in two such different Manners, while both arise from the same Principle, though they shew themselves in various Forms. Every Preparation of Iron is both aperient and astringent in Degree, and the only Difference between them is, that some of them operate more strongly one Way, some the other.

The Preparations of Iron in more frequent Use at present are, 1. The crude Filings reduced to an impalpable Powder. 2. The Salt or Vitriol of Iron, *Sal Martis*. 3. The *Crocus Martis Aperiens*, the aperient Crocus of Iron. 4. *Tinctura Martis cum Spiritu Salis*, the Tincture of Iron with Spirit of Salt. 5. The *Flores Martiales*, or Flowers of Iron. 6. The *Vinum Chalybeatum*, or Steel Wine. These are all accounted Aperients : Among the Astringents the two capital ones are 7. The *Crocus Martis Astringens*, or Astringent Crocus of Iron, and 8. The *Tinctura Antiphthysica*, or as it is called in the new *London Dispensatory*, *Tinctura Saturnina*, Tincture of Lead.

SAL MARTIS,
Salt of Iron.

Mix together a Quart of Water and eight Ounces of Oil of Vitriol ; pour the Oil of Vitriol in by a little at a Time, put the mixt Liquor into a glass Vessel, and add to it Filings of Iron, four Ounces ; when the Ebullition is over, evaporate the Liquor to a Pellicle, and set it to shoot, there will be a green Vitriol or Salt found in fair Crystals ; dry them for Use.

This Salt is one of the most powerful Preparations of this Metal we have in Use ; it opens Obstructions of all Kinds, and strengthens the Viscera. It is an excellent Medicine in Chachexies, in Obstructions of the Liver and Spleen, and in Suppressions of the Menfes. It is also found to have great Virtues against Worms. Our Chemists have a Way of saving themselves the Trouble of making this Salt by dissolving and crystallizing the common green Copperas ; this is however a Sophistication that may be pardoned, as the Salt prepared either Way is much the same. The best Manner of giving this Salt is in Solution ; half an Ounce of it in a Quart of Water ; four Ounces of this is a Dose, and if drank in the Manner of the natural Chalybeate Waters, it will be found to exceed most of them in its good Effects.

There are many Cases however in which the first Preparation, that is, the mere Powder of the Filings succeed better than any other Form. When they are taken in female Disorders, in which the Body is weak, languid, and full of Acidities, the Juices are themselves the best Menstruum in the World for it, as appears by its producing Eructations of the Smell of Garlick,
and

16 APERIENT CROCUS of IRON.

and by its tinging the Excrements black as Ink ; the natural Heat before wanting is always excited by this Means, and more Good is often found from it thus, than from all the labour'd Preparations that ever were invented.

CROCUS MARTIS APERIENS,

Aperient Crocus of Iron.

Expose a Quantity of pure iron Filings to the Air in the Spring Season, till by the Dews and Rains they are perfectly converted into a reddish Rust ; powder this, and keep it for Use.

There is another Way of preparing it with Sulphur thus. Mix together equal Quantities of iron Filings, and Powder of common Brimstone. Make them into a stiff Paste with Water ; roll it into a Ball, and lay it by for five or six Hours, it will swell and burst, and will half calcine with the Heat it acquires ; after this put it into an earthen Pan, set it over the Fire, and burn away the Sulphur. The remaining Matter is a red Powder, called *Crocus Martis Aperiens cum Sulphure*.

Either of these may be given from ten Grains to thirty for a Dose, in Cases of Obstructions, but the former and more simple Preparation is esteemed the best.

TINCTURA MARTIS CUM SPIRITU SALIS,

Tincture of Iron, with Spirit of Salt.

Take Filings of Iron half a Pound ; Glauber's Spirit of Sea Salt three Pounds ; rectify'd Spirit of Wine three Pints. Digest the Spirit of Salt and the Filings together without Heat, as long as the Spirit will work upon them ; then after the Fæces have subsided pour off the clear Liquor, evaporate it to one Pound, and to this add the Spirit of Wine.

This is a vastly preferable Tincture of Steel to any that have been in common Use, before the Publication of the late *London Dispensatory*. It is good in all the Cases in which the Salt or Crocus before described are.

FLORES MARTIALES,

Flowers of Iron.

Take of iron Filings, or of the Colcothar of common green Vitriol washed one Pound ; of crude Sal Armoniac two Pounds. Mix them together and sublime them in a Retort. Mix the Flowers again with the Residium at the Bottom of the Vessel, and repeat the Process till they are of a beautiful yellow Colour. To the Remainder may be added fresh Sal Armoniac half a Pound ; and the Sublimation being repeated more Flowers will arise like the former. This is the same with the *Ens Veneris* of Mr. Boyle, except that he used blue Vitriol ; though some suppose even his was made with a Vitriol of Iron, not one of Copper. Both however may be preserved as good Medicines. Mr. Boyle's calling his Flowers by the Name of *Ens Veneris*, does not indeed agree very well with the Opinion that he meant by the *Hungarian Vitriol*, which he orders any of the Vitriols of Iron.

The College Dispensatory orders a Lixivium to be made also of the Remainder of this, after the Sublimation is finished, by exposing what is left in the Retort to the open Air in a damp Place : It will there run into a Liquor, which is to be kept under the Name of a Lixivium of Iron.

The same Dispensatory also orders a Preparation of Steel with Sulphur, which had been retained in many of the former, and is made by only applying

ing a Piece of Steel, made white hot to a Roll of common Brimstone, held over a Vessel of Water. The Steel will melt on touching the Brimstone, and fall into the Water in round Drops ; these are to be powdered for Use. To these aperient Preparations we are also to add a Tincture, ordered in the same Dispensatory to be made by digesting four Ounces of the Martial Flowers above mentioned in a Pint of Proof Spirit, and the Steel Wine.

VINUM CHALYBEATUM,
Steel Wine.

Take Filings of Iron four Ounces ; Cinnamon and Mace of each half an Ounce ; of Rhenish Wine two Quarts ; infuse a Month without Heat, often shaking the Vessel, then filter it off for Use. This is the Prescription of the new *London Dispensatory*, and is vastly preferable to that of the former, where only Saffron was ordered.

This Wine is an excellent Stomachick and Aperient ; it may be drank a moderate Glass once or twice a Day, or mixed in Apozems of the aperient Vegetables.

CROCUS MARTIS ASTRINGENS,
Astringent Crocus of Iron.

Expose a Quantity of clean and fine iron Filings to the Air, and sprinkle them at Times with Vinegar ; let them remain thus till almost entirely converted into Rust, then expose the whole to a strong reverberatory Fire, till it become of a deep purple Colour. When cold levigate it to an impalpable Powder for Use.

This is given in the very contrary Indication to the simple aperient Crocus before mentioned ; it is found a good Medicine in Hæmorrhages, and in obstinate Diarrhœas and Dysenteries ; the Dose is from ten Grains to thirty : It must not be given in any Liquid, because it sinks to the Bottom too suddenly to be taken without Waste : In a Bolus or Pills it lies in a small Compass.

TINCTURA ANTIPHTHYSICA,
Antiphthysick Tincture.

This is called in the *London Dispensatory*, and that with great Reason, *Tinctura Saturnina*, as owing more of its Virtues to Lead than to Iron.

Take Sugar of Lead and green Vitriol, of each three Ounces ; rectified Spirit of Wine a Quart ; powder the Salts separately, and then digest them in the Spirit without Heat, and there will be a fine purple Tincture.

This is the most powerful Astringent and styptick Tincture that we are acquainted with ; its Dose is from fifteen to forty Drops.

C H A P T E R II.

P L U M B U M,
Lead.

LE A D is the heaviest of the Metals next after Gold ; it is indeed considerably lighter than Quicksilver, but the Want of Malleability denying that Substance a Place in the Class of Metals, Lead is among them the second in Weight. It is the softest of all the Metals ; easily flatted under the Hammer, and ductile in a very great Degree, though much less so than Gold. Its Colour

lour is a pale bluish grey, it is very little subject to Rust, and is the least sonorous of all the Metals except Gold, with which it seems about upon an Equality in regard to this Property in its common State; but Mr. *Reaumur* has discovered that if cast in the Form of a Segment of a Sphere it has some Sound when struck upon; a Property which Gold does not acquire by being cast into the same Form.

It requires the least Degree of Fire of all the Metals, except Tin, to put it in Fusion. It acquires this fluid State long before it changes its Colour; whereas the other Metals, except Tin, all become red hot before they run: After melting it very readily calcines into a grey Powder, which if the Fire be encreased and the Matter often stir'd becomes yellow, and afterwards of a fine florid red: This is the Minium or common red Lead of the Shops. If the Fire be made yet more vehement it runs into an oleaginous Matter, which, as it cools, becomes of a yellowish or reddish Colour, and is composed of a Number of thin Laminæ; this is Litharge.

Though these several Substances have nothing of the Appearance of the Metal they are produced from, yet if a little iron Filings be added to them over the Fire, or only some Pieces of Charcoal, or any oily inflammable Matter be thrown in they become Lead again. The Scorix of Lead left to themselves in a strong Fire always run into Glafs, and in that Form make their Way through all Sorts of Vessels.

Lead very readily and easily amalgamates with Mercury, and as readily mixes in Fusion with all the other Metals, except Iron, though less easily with Copper than with the rest. The specifick Gravity of Lead is to that of Water as 11322 to 1000. Lead exposed to the Solar Fire, concentrated in the Focus of a large burning Glafs, immediately melts, emits a great Quantity of Fumes, and soon calcines to a grey Powder: This in a few Moments goes through all the Changes already mentioned of the Calx of Lead in the common Fire, becoming yellow, and immediately after red, and then running into a thin Liquor like Oil, which if suffered to remain longer in the Heat evaporates wholly in Fumes; but if taken away as soon as it runs and suffered to cool, is found to be a semi-vitrified Substance something resembling Litharge, being composed of yellowish transparent Plates resembling Flakes of Talk. This Substance if afterwards exposed to the same Focus on a Piece of Charcoal assumes the Form of Lead again.

It is evident from all this, that Lead is composed of a vitrifiable Earth and a Sulphur or Phlogiston, and that the Earth alone is the Thing that constitutes the Nature of the Metal; for the Sulphur of Charcoal in this Experiment, and that of any fat Substance in the other by the common Fire, is capable of supplying the Place of that originally contained in the Metal, and of reducing the Calx from which it had been dissipated, and which in Consequence of that had lost its metalline Quality, into true and perfect Metal as it was before.

Lead when kept in Fusion over a common Fire, throws up all other Bodies, except Gold, that are mixed with it, all others being lighter, except Mercury, which will not bear that Degree of Heat; it afterwards vitrifies with the baser Metals, and carries them off in Form of Scorix to the Sides of the Vessel.

The weakest Acids are the best Solvents for Lead; it dissolves very readily in Aqua Fortis diluted with Water, as also in Vinegar, and on receiving the

Fumes

Fumes of the weakest Acids it is corroded, and forms a white Caix which is called Ceruss. Whatever Liquor Lead is dissolved in, the Solution acquires a disagreeable and sweetish Taste.

If Lead be heated till it smoaks, and Copper in thin Plates be put into it in that State, the Lead boils up very vehemently, and the Copper breaks and blends with it. If the mixed Mass be then suffered to cool, it is found to be very brittle, and resembles cast Iron where it is fresh broken. Gold and Silver also become brittle on being mixed with Lead in Fusion, and the Gold loses its Yellowness in a great Measure by a very small Quantity of this Metal being mixed with it.

If Lead and Tin be melted together the Tin is thrown up to the Surface in little dusty Globules, it becomes in part calcin'd there, and is afterwards tinged with several Colours, especially with red and yellow. Bismuth and Zink readily mix with Lead in Fusion, but they very greatly injure it in point of Malleability.

Lead when in the Bowels of the Earth it enters into the Body of Crystals, as is very frequently the Case with that Crystal which is found about Lead Mines, influences its Figure so far as to give it a cubic Form. It often does this without at all altering its Colour, but when it tinges it likewise, the Colour it gives is yellow.

The Topaz among the Gems owes its yellow Colour to this Metal, and in the factitious Gems we find that the Tinge it gives to the Composition is always a yellow approaching to that of the Topaz.

Lead is met with in the Mines in a great Variety of Forms and Appearances. There have not been wanting Authors who have talked of its being found native and pure in the Earth; but there seems to be a Mistake in this, all the Specimens that we know of preserved as native Lead being in Reality malleable Silver Ores.

Lead-Ore is usually of a Colour and Appearance that easily distinguish it to the Eye to be such. It is of the Colour of Lead itself, or a little darker, very bright and glossy where fresh broken, and composed either of cubic or parallelloipeded Masses, or of smaller Granules, or else of long Striæ; in the first State it is commonly called Potter's Lead-Ore, or cubic or diced Lead-Ore, in the second Steel-grain'd Lead-Ore, and in the third, from its Resemblance to Antimony, antimoniated Lead-Ore; when, as is sometimes the Case, the Striæ of this Kind are loose or detach'd from one another, it is called capillary or stringy Lead-Ore, and finally when they run not regularly Side by Side the whole Length of the Mass, but cross and intersect one another, it is called cross-grain'd Lead-Ore. However different these several Ores may appear from one another, they are in Reality very like when compared with the Assistance of Glasses, that shew more distinctly than the naked Eye can discover it, the Structure of their Parts. The diced Lead-Ore is form'd of several parallelloipeded Masses, exactly in the Manner of many of the Spars, each of these Masses being in both Cases form'd of thin Plates, which are again composed of smaller parallelloipedes, and so on as far as we are able to trace them; and as to the Steel-grain'd and antimoniated Lead-Ores, they also are form'd of Masses of the very same Kind, only mutilated more or less in their Figures, and either disposed in Striæ, or thrown

together in less regular Congeries instead of being formed into larger Masses of the same Kind, and from those into the common Congeries of them which we see in the ordinary State of that Ore.

Beside these several Appearances of the Ores of Lead, in all which it has the evident Marks of that Metal obviously impressed on it, there is a very curious Kind which is green, and of a Crystalline Substance; this is usually formed into irregular Columns, and lodged in or mixed among a brown stony Substance of the Nature of Calamine: this has not the least Appearance of Lead, but it contains a very considerable Quantity of it, and with it some Zink. There is also in some of the *German* Mines a greyish and in some others an absolutely pellucid and colourless Lead-Ore both resembling Crystal more or less pure, and both very rich in Lead, but these are all very rare. Authors tell us beside these of red, white, and grey Lead-Ores of an earthy or stony Structure, but these are erroneous Accounts, the whole amounting to no more than that there are white, red, or grey Earths and Stones, in which some Fragments of the common cubic Lead-Ore are immersed, the Stones or Earths themselves containing nothing of that Metal. These Fragments are sometimes too small to be distinguished by the naked Eye, but a Microscope never fails to discover them.

Lead is more easily separated from its common Ores than any other Metal; there requires nothing for this Purpose, but a common wood Fire kept up to a due Strength by the Blast of Bellows. The Lead-Ore is thrown into this Fire upon the Wood, and the melted Metal runs into a Hollow at the Bottom of the Furnace made to receive it, from which they ladle it out and cast it into large Masses. Such Ores of Lead as contain Earth and Stones are to be powdered and washed before they are committed to the Fire, and such as contain Pyrites or Marchasite, which is no uncommon thing, must be roasted two or three times, in order to burn away the Sulphur they are debased with, then powdered and washed in order to their being committed to the Fire, and finally mixed with the common black Flux if very refractory. If there be Occasion to separate Lead from a Mixture of Copper in the Regulus, nothing is more easy than to do it by a common Fire, the Heat of which being enough to melt Lead, tho' not to fuse Copper, will run it all off, and leave the Copper pure behind.

There is some Confusion among the ancient Writers on the Subject of Lead: they have among the Greeks separate Names for Lead and Tin; yet they frequently use, what we understand to be more properly the Name of Tin, *Cassiteros*, to express both: and so late an Author as *Agricola* has used the Name of Lead, *Plumbum*, as a Sort of generical Term, expressing by it three different metalline Substances, two of them Metals, and one a Semi-metal; he calls all these *Plumba*, and only distinguishes them by their Colours, calling one white *Plumbum*, this is Tin; another ash-coloured *Plumbum*, by which he means Bismuth; and the last livid or blackish *Plumbum*, by which he means Lead. Wherever we meet with the Word *Molybdos* among the *Greeks*, we are certain that they always mean Lead by it, and whatever *Pliny* says of *Plumbum nigrum*, is also to be understood of the same Metal. The *Arabian* Authors call it *Rafas*, and the chemical Writers *Saturnus*. The Character by which these last express it is ♄ , by which they mean to signify, that it has something of the Nature of Silver, as there

is a Part of the Figure of a Crescent in it, but that it is joined with something corrosive.

Lead has been celebrated by the chemical Writers for very great Virtues in Medicine, but upon the whole it seems to be a Metal very cautiously to be given internally, and rather calculated for outward Application. Its Ore is poisonous: the Steam that arises from the Furnaces where it is work'd, infects the Grasse of all the neighbouring Places, and kills the Animals that feed on it; and among the Preparations of it its Salt call'd *Saccharum Saturni*, which is by much its best Form for Medicine, and which is able to do great good in Hæmorrhages and some other Cases, is apt however to bring on Cholicks of a very violent Kind, and so many other Disorders, that the Remedy often proves worse even than the Disease.

The Preparations of Lead most in Use are, 1. The *Minium*, or red Lead. 2. Litharge. 3. Burnt Lead, or *Plumbum ustum*. 4. Cerufs. And, 5. Salt, or Sugar of Lead.

MINIUM,
Red Lead.

Melt Lead in a broad earthen Vessel unglaz'd, and stir it continually with a Spatula till it be calcin'd into a grey Powder, this is call'd the Calx of Lead. Continue the Fire, stirring it in the same manner and it becomes yellow; in this State it is used in Painting, and is call'd Masticot, or Massicot: after this, put it into a reverberatory Furnace and it will calcine farther, and become of a fine Red, which is the common *Minium*, or red Lead.

This is used externally on many Occasions. It obtunds the Acrimony of the Humors, allays Inflammations, and is excellent in the cleansing and healing of old Ulcers: It is used in many of the Plaisters and Ointments of the Shops on these Occasions. We are not to suppose that the *Greeks* meant red Lead by the word *Minium*, it was their Name for Cinnabar.

LITHARGYRUS,
Litharge.

This Preparation, or as it may be more properly call'd Recrement of Lead, is of two Kinds, differing in Colour, tho' in no other Quality: the Ancients, as well as ourselves observed this Difference, and call'd the one as we do, Litharge of Gold, and the other Litharge of Silver. This Recrement of Lead is not prepared by a formal Process on purpose; it is collected from the Furnaces where Silver is separated from Lead, or from those where Gold and Silver are purified by means of that Metal; but in the Furnaces used for either of these Purposes, it is generally run into Lead again to serve for the same or other Uses. The Litharge sold in the Shops is produced in the Copper-works where Lead has been used to purify that Metal, or to separate Silver from it. Of all the various metalline and mineral Substances which are separated from Gold or Silver by means of Lead, there is none but Copper which remains embodied in and intimately joined with that Metal after Scorification. The others being either not at all received into the Body of it, or if they are, being either destroy'd before Scorification, or finally if they remain mixed with it longer they split and destroy the Vessels. The Recrement produced from this Combination of Lead with Copper is our common Litharge. It is of a yellower or redder Colour as the Fire has been more or less strong, and is always composed of a multitude
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of thin Flakes resembling the Spangles of Talc, in those Fossils called *Mica* or *Glimmers*.

The greatest Quantities of Litharge are brought from *Sweden*, *Germany* and *Denmark*, *Poland* furnishes some, as does also our own Country, but the *Dantzick* Kind is esteemed the most valuable. The best Litharge is that which is most calcined and of the liveliest Colour. Litharge on the whole is properly Lead vitrify'd, either alone, or with a Mixture of Copper.

Litharge is soluble in Oil and all other unctuous Substances, and thus dissolved it makes the Basis of a great Part of the Ointments and Plaisters of the Shops. It is drying, abstergent and slightly astringent, and hence it is of great Use in the cleansing Ulcers and disposing them to incarnate. The best Method of preparing Litharge is to grind it in a Mortar with a large Quantity of common Water, and to pour this off thick, and add fresh Water to the remainder again and again, till all the Litharge is washed off, and the Fæces or imperfectly vitrify'd Matters are left in the Mortar. The Litharge subsiding from these Liquors is to be kept for Use after carefully drying it.

PLUMBUM USTUM,

Burnt Lead.

Cut a Quantity of the thinnest mill'd Lead that can be got into small Plates: fill an earthen Vessel that will bear the Fire with these Plates, and Powder of comon Brimstone laid *Stratum super Stratum*, set it over the Fire, and when the Sulphur is burnt away, the Lead will be found reduced to a blackish Powder. Five Ounces of Brimstone is about enough for half a Pound of Lead. The Matter is to be stir'd while it remains on the Fire, and when it is cold the Powder is to be washed three or four times with common Water, and then dry'd for Use. It is intended only for external Use, and is of the same Virtue as Litharge or red Lead in Ointments and Plaisters. Mixed into an Unguent with Lard alone, it makes a good Ointment for the Piles.

CERUSSA,

White Lead, or Ceruss.

This is a sort of Calx of Lead made by exposing Plates of that Metal to the Vapour of Vinegar: 'tis remarkable that this Preparation of Lead has been in Use ever since the Days of *Theophrastus*, and that it was prepared in his Time in the very same manner that it is at present. The *Greeks* call'd it *Psimuthion*, the *Arabians* *Affidhegi*, or *Affidagi*. The usual Method of making it is by covering an earthen Vessel in which there is some sharp Vinegar, with a Plate of Lead, or by suspending several such Plates above the Surface of the Vinegar, and setting it in a place where it may be gently warm, the whole Substance of the Lead, or at least a great Part of it, is thus in ten Days or a Fortnight converted into this white Matter, and this is to be separated for Use.

A much better and more ready way of making it however is that recommended by *Boerhaave*. A Glass Cucurbit is to be cut off in such a manner as to leave it a very large Mouth. An Alembick Head of Glass is to be fitted to this; some Vinegar is to be put into the Body, and a number of thin Plates of Lead are to be placed in the Head, in such a manner that they stand somewhat erect. When the Head is fitted on, the Body is to be set in a gentle Sand-heat for twelve Hours, the Fire is then to be put out, and after twelve Hours more, unluting the Vessels, the Receiver which had been fitted to the Nose of the Head, will contain
a sweet,

a sweet, and styptick Liquor, nauseous and turbid, call'd the Vinegar of Lead, or Solution of Lead; and the Plates of Lead taken out of the Head will be found covered with a white dusty Matter. This is Cerufs, and if the Operation be repeated, the whole Lead will be in fine reduced to this state of Cerufs.

If the same Process be used with Plates of Iron or Copper, they are in the same manner converted into a Calx, that of Iron being Red, and that of Copper Green.

Cerufs is of great Use externally, either mixed in Ointments, or used in dry Powder, sprinkling it on old Ulcers, and watery running Sores, and in many Diseases of the Skin. The finer Part of this Calx of Lead received into the Lungs, as is continually done by those People who work upon the grinding and preparing it, brings on violent and usually incurable Asthmas, and sometimes Palsies and other nervous Complaints. This has made the generality of the World believe that taken internally in the common way it would be poisonous even in the smallest Doses, and we are told that it occasions inveterate Distempers in the Viscera, Fainting, Weakness, Pains, and finally Death itself. I have known a Country Apothecary however, who ventured to give it in small Quantities in leprous and the like desperate Cases for a long time, purging every fourth Day between the Doses. I am even a Witness that he sometimes performed Cures by it, but at others it brought on Cholicks sometimes of the most terrible Kind, and I wish I could say that Death had not been the Consequence of some of them. It is an Ingredient in the *Trochisci Albi* of *Rhasis*, and in many of the Ointments of the Shops.

The Painters use it also in great Quantities, and that it may be afforded cheap to them, it is generally adulterated with common Whiting, which is Chalk wash'd to a Fineness and formed into Cakes. The *English* and *Dutch* Cerufs are very bad in this respect, the *Venetian* ought always to be used by the Apothecaries.

SACCHARUM SATURNI,
Salt or Sugar of Lead.

Put into a large Glass Cucurbit any Quantity of true *Venetian* Cerufs, or such as is not adulterated with Chalk, pour on it twenty times its Weight of good distill'd Vinegar, set the Vessel in Sand and make the Vinegar boil for three or four Hours, when it has settled pour off the clear Liquor, and add more Vinegar to the remainder: continue the same Operation, adding still fresh Vinegar till the Cerufs is nearly all dissolved. Mix the Liquors, and this is called also Vinegar of Lead; if it be intended for keeping under this form a Part of it is to be evaporated or distill'd off, which will be a nauseous Water only, all the Sharpness of the Vinegar remaining behind: If the Salt of Lead is to be prepared, this Vinegar is to be inspissated in a Sand-heat to the Thickness of Oil; it is then to be set in a cool quiet Place, and after a few Hours a Salt of a whitish Colour will shoot at the bottom of the Vessel, in fine long and erect Spiculæ, which by degrees growing more and more numerous, will form a Cake of a spongy and striated Texture. Let the Liquor be poured off, and this Cake of Salt dry'd by a gentle Heat; it will become tolerably white. This is the *Saccharum Saturni*, or Sugar of Lead. It may be prepared in the same manner from a Solution of any other of the Preparations of Lead as well as Cerufs, or even from the Vinegar of Lead, produced in the making Cerufs in *Boerhaave's* way, but it is so a more tedious Operation. The

The Vinegar of Lead is used by some for Pimples and other Eruptions that disfigure the Face, which it cures by washing them with it: an Ointment may also be prepared from it, only by mixing it with Oil of Roses, or some other Oil of that Kind, and working them together in a leaden Mortar for some Hours, they will thus form a thick unguent like Butter. This is called Butter of Lead, and is an excellent Medicine used by way of Liniment in Eruptions of almost all Kinds.

The Sugar of Lead is greatly recommended by some internally, in Dysenteries and Hæmorrhages of all Kinds, but the generality of the World condemn it, as containing all the poisonous Qualities of the Metal it is made from in their highest Degree. Perhaps it may not be adviseable to recommend it to general Practice, tho' I can affirm with great Certainty that it will succeed when nothing else is of Effect in Hæmorrhages. Myself have had one which when so desperate as to elude all that the eminent Physicians of the Age could do against it, I cur'd by so desperate a Medicine as a Dram of this Salt dissolved in a Pint of Water, acidulated with Spirit of Vitriol, and taken at four or five Doses at proper Intervals. No bad Symptom attended it, tho' its Effects against the Disease appear'd little less than miraculous.

Externally it has been long famous for many Virtues, it is good against Inflammations of all Kinds, and is us'd in Embrocations, and in small Quantities in Collyriums for the Eyes, and in the Erisypelas: it deterges, dries and cicatrises Ulcers, and in a Gonorrhœa is mix'd in Injections with great Success.

If one Ounce of Sugar of Lead, and two of Oil of Turpentine be mix'd together and set in a Sand-heat till the Salt is dissolved, the Oil acquires a red Colour, and is call'd Balsam of Lead. This is also an external Medicine, and greatly famed for its Effects in old and sharp Ulcers.

C H A P T E R III.

C U P R U M,

Copper.

COPPER is the lightest of all the Metals except Iron and Tin. It is found on the strictest Trials to be much more simple in its Nature than Iron, tho' greatly less so than Gold or Silver. It is considerably hard; it is not equal indeed to Iron in this respect, but after that it claims the Title of the hardest Metal: it very happily communicates that Quality to Gold and Silver which greatly want it, and with which it readily mixes in Fusion, and is the best of all Alloys for both. It is malleable much more easily than Iron, tho' it does not spread under the Hammer so readily as any of the other Metals except that. It is ductile to a very great Degree: in its natural State we see it drawn out into extremely fine Wire, and in the Form of Brasses, in which it is only alter'd in Colour by an Admixture of a Semi-metal Zink: It is beaten into Leaves in the manner of Gold, which, tho' not quite so thin as those of that Metal, serve so many Purposes in their Place.

It is the most liable to rust of all the Metals, being susceptible of Impressions from all kinds of Salts, and all unctuous Bodies; in short, almost every thing in Nature is a Solvent for it. If only expos'd to a moist Air, it readily acquires a
green

green Rust, and even Water in Time will dissolve it. It is remarkably sonorous, and is indeed the Basis of almost all the compound Metals in which that Quality is expected. It requires a very considerable Degree of Fire to melt it; less indeed than is necessary to the fusing of Iron, but much greater than that required for the making any of the other Metals run; on this is founded that easy Practice of separating all the other Metals, except Iron, from Copper, by what is call'd Eliquation: For if the Fire be kept up just under the Degree necessary to melt a Plate of Copper, every other Metal will run and be perfectly separated from it, if Iron be not there. Copper grows red hot before it melts, and when in a state of Fusion is destructive to every Body near it, if but the least Quantity of Water be in the way of its Course, a single Drop being enough to scatter a vast Quantity of melted Copper about like Shot from a Gun. It amalgamates with Mercury, but not without considerable Difficulty: melted with Antimony it readily runs into Scoria or vitrifies, and the same Effect is produced, tho' not so suddenly, on fusing it with Iron.

Filings of Copper thrown into the Flame of a Candle become red hot as they pass thro' it, but they do not sparkle, they tinge the Flame however of a green Colour. If one Part of Filings of Copper, and two Parts of corrosive Sublimate be put together into a glass Retort, and the Matter distill'd, the Quicksilver will be freed from its Salts, and found in the Form of common crude Mercury in the Receiver, and the Copper will remain at the Bottom of the Retort, intimately blended with the Salts, and in Form of a yellowish or reddish Resin, more or less transparent according to the Degree of Fire that has been used. This will melt at the Flame of a Candle, and will easily take Fire, yielding a greenish Flame.

Arsenick or Quicksilver mixed with Copper make it white like Silver, but it is brittle when thus whitened. If Copper after Fusion be urg'd by a very violent and long continued Fire, it finally calcines into a reddish Calx. Expos'd to the solar Heat collected in the Focus of a large Burning Glass, it very readily assumes this Form of a reddish Calx, which it so difficultly acquires in a common Fire; and soon after it is in this State, if it be laid upon a Stone or Copel in the Focus it runs into a deep red Glass; but this exposed again to the same Heat, on a piece of Charcoal, receives from the vegetable Sulphur of that Body the Phlogiston or inflammable Principle it had lost in the former Operation, and becomes pure Copper again. If exposed from the beginning on a Charcoal, it will never vitrify at all, that vegetable Coal supplying its Sulphur as fast as it is dissipated from it by the Heat. The same thing happens to the other Metals also, whence it is easy to conclude, that the Sulphur they contain is the same in all of them, and is not different from that of common vegetable Substances, and therefore that it is the Earth or vitrifiable Matter that is different in each, and that on this alone depends the peculiar Form of the Metal.

The specific Gravity of Copper is delivered by the Hydrostatical Writers, as from 8500 to 9150, to 1000 to that of Water. The purest Copper I have been able to procure, nicely weighed, is to Water as 8810 to 1000.

The extreme Divisibility of this Metal almost exceeds Imagination; Mr. Boyle observes, that a Grain of it dissolved in an Alkaly, will give a sensible Colour to more than five hundred thousand times its Weight of Water. If we were to enumerate the Solvents of this Metal, there is scarce any thing that could be left
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out of the Account. It very readily dissolves in Aqua Fortis, Aqua Regia, Spirit of Salt, and in short in all the stronger, and even in all the weaker Acids, the very mildest of the vegetable Tribe being able to produce a green Tincture from it, and to acquire an emetick Virtue by being suffered to stand in it. All Salts dissolve it very readily, the Acids afford a green Solution of it, the Alkalies, and particularly the volatile urinous Kinds, a blue one that is equal to the finest Colour in the Painters whole Materia, not excepting even the Ultramarine.

Copper acts itself as a Menstruum upon Iron, for being put into the Fire with it, it greatly promotes its Fusion, but the Metal becomes more rigid and of a paler Colour by the Mixture. In order to make this Fusion yet the easier, it will be proper to throw over the Mixture such a Quantity of a flux Powder made of Tartar and common Glass powdered, as will cover it a quarter of an Inch deep.

Copper melted with Zink makes the yellow Metal we call Brass, this Operation is usually perform'd not with pure Zink, but with Calamine, but this tho' not always understood to be the Ore of Zink, is now very well known to be so, and therefore the Mixture is the same as if Zink were added in its separated State, except that it is done by the Calamine in a more rude and indeterminate Way. One third or one fourth Part of Zink is all that is usually received into the Copper in this Process: the Metal is found to weigh about so much more when taken out in the State of Brass, than it did when put into the Furnace in Form of Copper; yet is the Metal when cold scarce at all less malleable than the pure Copper was, tho' while hot it is extremely brittle.

Copper in the Bowels of the Earth is not known to give any determinate Figure to the Crystals or Spars, whose Composition it enters, but it is very apt to colour them sometimes with a Green, and sometimes with a fine Blue. The Colours bestowed by this are the most beautiful of those given by any Metal, if we except the elegant Red of the Ruby which is owing to Gold. The Emerald and the Sapphire both owe their Colour to Copper, and in the making of the factitious Gems or coloured Glasses, we find it easy by means of this Metal to come up to the Beauty of Colours in those Gems, tho' not to their Hardness.

Copper is call'd by the Chemists *Venus* and *Meretrix Publica*, from its receiving all kinds of Menstruums, the other Metals having all their appropriated ones. The Character by which they express it is ♀ a Circle with a Cross underneath it, what they would denote by this is that the Body or Basis of Copper is Gold, but that it is debas'd by some corrosive Matter. The Cross among their Figures signifying corrosive.

The Ores of Copper are variable almost without End. It is found frequently native in the Earth in the utmost Purity, sometimes in solid Masses, and at others in ramose or botryoide Forms. The Masses of native Copper are usually not very large, but in *Cornwall* there has been lately met with a Piece of near one hundred and sixty pound Weight, of a high Colour but variegated in some Places with Spots of that fine green enamel-like Matter, which the Medalists call the Venerable Erugo. Many of the richest Ores of Copper are metal-line Masses of an iron Colour, or of a deep Grey; but the greater Part of them manifest the Metal they contain more plainly, by being tinged with Green or Blue in a very beautiful manner. There are many grey and reddish Stones in which Copper discovers itself in green or blue Spots, some of these are rich enough,

enough, others too poor for working. The green and blue Ochres also contain Copper in large Quantities, they are properly the Ochres of Copper, as the yellow ones are of Iron. In the *German* Mines a very rich Copper-Ore is found of a reddish grey Colour very heavy, bright and sparkling when fresh broken, and usually of a more or less regularly striated Texture. The Mallein Copper-Ore of *Cornwall* approaches nearest of any *English* Ore to this Kind. It is always very rich in the Metal, sometimes containing not less than one half its Weight of it.

The Mines of *Germany* and *Sweden* also afford a very beautiful green Copper-Ore, sometimes deeper, sometimes paler in Colour, but always considerably hard; it is found in large Masses of very irregular Figures, and often rising into Tubercles, sometimes into ramose Efflorescences like Shrubs on the Surface. This usually contains about forty Pound of Copper in the hundred Weight. Another of the *Swedish* Ores is of a fine deep blue, equal to that of the *Lapis Lazuli*, but the Substance is less hard, and is frequently debased by a Mixture of a greyish Earth; this sometimes yields sixty Pound of Copper from the hundred: finally, another of the rich Ores of this Metal is of a purplish and blackish Colour in different Places; this is very hard, and breaks with an even and glossy Surface; it contains usually about thirty Pound of Metal in the hundred Weight.

These are what may be properly called the richer Ores of this Metal, they are usually accompanied with some crystalline or sparry Matter in the Loads or Veins where they lie, and these Bodies being usually ting'd to a green or a blue Colour by the Metal, make a very elegant Appearance, many of them being scarce inferior to Sapphires and Emeralds. Among the most beautiful of these attendant Substances of the Copper-Ores, may be reckoned those small and often globular Masses of a striated Texture, and elegant green Colour, which resemble the *Porpita* of Naturalists, and want only Transparence to be of the Number of the most beautiful Fossils Nature affords us.

The poorer Ores of Copper are generally of the Figure and Texture of common Stones or Earth, and betray themselves only by the green or blue Efflorescences which are about them.

We are not however to close the List of Copper-Ores without introducing into the Number of them two very elegant Bodies, which tho' truly no other than Ores of this Metal are ranked by Authors in general among a much nobler Class of Fossils, the Semi-pellucid Gems.

These are the *Lapis Lazuli*, and one of the two Kinds of the Turquoise, or as it is usually called the *Turkey-stone*.

LAPIS LAZULI,
The Azure Stone.

This is one of those Ores of Copper, the Basis of which is a debased crystalline Matter, coloured with that elegant and beautiful Blue, which this Metal gives in our Experiments to all alkaline Liquors. It is a very compact and hard Stone, inasmuch as to come into the Rank of those that take a high Polish, and are not liable to be scratch'd by Accidents; and therefore is worked into a Number of different Toys. It is found in detached Lumps usually of the Size of a Man's Fist, often smaller, and sometimes of four or five Pounds Weight. It is never covered with any Coat or Crust, but resembles those Stones

which have been washed off from whole Strata, and smoothed or rounded by Accidents afterwards. It is of a naturally smooth and glossy Surface, and its general Colour is the elegant Blue already mentioned; but this is variegated in a very beautiful Manner, with Spots or Clouds of White, and with Veins of a fine shining gold Colour. It has these Variegations in different Degrees in the several Masses, and is in general most to be valued as it has least of them; for though very beautiful to the Eye, they are foreign to all the Uses it is put to, except when it is cut as a Gem. The white Clouds or Veins (for this Matter is sometimes though more rarely disposed in the last Form) are usually of a dead and opaque Hue, but sometimes they are bright and pellucid as Crystal; this last State of them adds greatly to the Beauty of the Stone: The yellow ones are always bright and glossy; they have been supposed by many to be Veins of Gold, and the Stone has been thence called a Gold-Ore; but they are in reality only Marcasite. Sometimes this gold-like Matter is not disposed in Veins but in Spots and Stars, and in this Case the Stone is the Sapphire of the Antients, for they knew the Gem we call the Sapphire by a very different Name, calling it the *Sky-blue Beryll*; and describing what they meant by the Word Sapphire to be a Stone opaque, of a fine Blue, and variegated with Spots of gold Colour in Form of Stars. All these Variations of this Stone are subject beside to other accidental Foulnesses, and are sometimes debased to the State of a mere common blue Copper-Ore.

The *Lapis Lazuli* is found in many Parts of the World, but that of *Asia* and *Africa*, in both which Countries it is frequent, is vastly superior both in Beauty and real Value to the *Bohemian* and *German* Kind, which is brought too often to us in its Place. It is to be chosen heavy, of a close fine Texture, and of a deep Indigo-blue Colour, with as little white Matter about it, and with as few of the ornamental gold-coloured Veins in it as possible, and such as when put into the Fire calcines without emitting any Smell. We are sensible that these Directions are contrary to those of the People, who want it to cut for ornamental Works; but tho' they may esteem it for its golden Veins, it is much the worse for them, in regard to its medicinal Use, and even for the Painters Purposes. Its Virtues in Medicine are those of a very violent Purgative and Emetic. It stands greatly recommended against Apoplexies, Epilepsies, Melancholly, and Quartan Agues; but the present Practice takes no Notice of it in any of these Intentions. Its Violence in its Operation has frightened People out of the Use of it. They have endeavoured indeed to edulcorate and make it milder by washing, but in vain. Its Virtues, which are owing to the Copper it contains, lie much too deep to be affected by such superficial Operations: even a great Fire makes no Alteration in it. It is an Ingredient in the Confection of Alkermes, as the Receipt for it stands in all the old Dispensatories. One might wonder how a Medicine of this Kind obtained a Place in a Cordial and strengthening Confection; but we are to consider that the old Authors all acknowledged a styptic Virtue in it as well as an Emetic, nay, they thought the styptic or restraining Quality its only innate and proper one, and its emetic and purgative Effects only to be owing to some heterogenous Particles among it which might be washed out: They gave it a place in this Medicine merely as a Restrictant. The chymical Writers give us Processes for Magisteries, Tinctures and Elixers of *Lapis Lazuli*, but they are wholly

wholly out of Use. Whatever may be the present Credit of this beautiful Stone in Medicine however, the Painters are indebted to it for one of the noblest Colours they are acquainted with; their Ultramarine being only a Calcination of this Stone. The *German Lapis Lazuli* does not answer well in this Process, and discovers itself by its calcining easier than the *African* or *Asiatic* and turning greenish. The Oriental Kind calcines to a finer Blue than it naturally has, and retains that Colour for ever. After calcining the Stone in a clear Fire of Charcoal, they grind it to an impalpable Powder on a Porphyry, and then mixing it up in a Paste composed of Pitch, Wax, and Oil, they work it about in the Hands; and finally, kneading this Paste in a Vessel of clear Water as the Powder separates from the viscid Matter it sinks to the Bottom: When all that is perfectly fine is thus worked out, they let the Water be drained off, and dry the Powder for Use. What remains embodied in the Paste is afterwards separated, and makes a worse Kind than the former, though even the very meanest Ultramarine is a very beautiful Colour.

TURCHESIA,
The Turquoise.

The Turquoise has at all times been esteemed a Gem, though more opaque than any other Substance that was ever honoured with that Name. It however very ill merits so pompous a Title, all of it being either Copper-Ore, or what is yet farther than that from the Nature of a Gem. There are indeed two Kinds of this Gem, as it is call'd, distinguished by the same common Name: The one is a true and genuine Ore of this Metal, the other the Bones of Animals tinged to an elegant blue Colour, by having lain in Places under the Earth, where Copper has been near them.

That Kind which we usually distinguish by the Name of the Turquoise of the old Rock, and which *Pliny* and the Antients called *Calais*, is a true and genuine Copper-Ore, and is of exactly that Kind in regard to this Metal, that the Hæmatites is to Iron: It is found in the perpendicular Fissures of the Strata of Stone, which contain Copper, adhering to their Sides in Form of a Crust, and rising into botryoide Efflorescences, which sometimes stand single, and are in Bigness from the Size of a Pea to that of a Walnut; but sometimes happening to be placed close to one another, they join and form flat Crusts, or Masses, extending in the manner of the Crusts of the Hæmatites, to three, four, or more Inches in Breadth; in these the prominent Part of every Tubercle appearing on the Surface, the whole seems a Conjunction of semicircular Bodies of a fine blue Colour joined by an intermediate Substance of the same Nature.

This Kind of the Turquoise is of a very close Texture and glossy Surface, but it is very soft, and when broken it shews the same crustated and striated Texture with the Hæmatites, only that the Striæ are usually finer, and the Plates better joined. It ferments with *Aqua Fortis*, and may be in great Part dissolved by it; and on calcining it loses all its Colour, and becomes of a dirty white. This is produced in *Persia* and in some other Parts of the *East*. The *Germans* have also a botryoide Copper-Ore in some of their Mines; but it is green, and much softer than the true Turquoise of this Kind, though this has been often produced among us also under the Name of that Gem.

The other Turquoise is nothing more than the Teeth or Bones of Animals, which have lain in the Way of Effluvia, in which Copper has been contained,
and

and by this Means have acquired Veins and Streaks of a deep blue, which on the whole being slightly calcined, diffuse themselves through all the Substance, and give it the fine pale Blue we so much admire in this Gem. If the Fire that diffuses this Colour be a little too strong, it sends it wholly off, and leaves in the Place of the Turquoise only a white Bone. The Turquoises of this last Kind are common in *France*; there are Mines of them there, and the People who work them are perfectly acquainted with the Method of diffusing the Colour through them. These are what are now usually worn, and when fine, are called by many of our Jewellers Turquoises of the old Rock as well as the other. The Virtues attributed to this Gem are very great, but all that we know of it at present is, that like the other Bodies that contain Copper it is a violent Emetic, and not at all fit to be received into Practice.

There is something singular in the former of these two Ores, the *Lapis Lazuli*, that it does not lose its Colour in the Fire; whereas all the other Bodies we are acquainted with, which owe their Colour to Copper do, the Sapphire itself not excepted, which in a very slight Degree of Heat will lose all its blue, and become colourless as Crystal: that this is a Copper-Ore however appears evidently enough from its violent emetic Quality, and in that Copper may be separated from it by the proper Processes; as to the Turquoise, it yields near one third of its Weight in pure Copper; and Nature hardly furnishes us an Ore from which this Metal is more easily separated.

There is not any Metal which gives the Persons concerned in the procuring it from its Ore so much Trouble as Copper. We have observed that the rich Ores of it frequently contain Silver. In this Case, there is a peculiar Operation for the separating this Metal by Eliquation from the Blocks of the half-finished Copper, which is afterwards to be brought to the State of pure and malleable Copper by repeated Fusions. The Ores of this Metal which work best of all require many Calcinations, Powderings, and Washings, and after these several repeated Meltings before the Metal is fit for Use.

When they contain Earths and Stones that will not be separated by washing, which often happens, they require the Addition of peculiar Fluxes; in this Case the common Sandiver mixed with the black Flux is an excellent Assistant. When the Ores of Copper contain Iron also, there is great Trouble with them. The Copper acting as a Menstruum on the Iron, dissolves it in a much less Degree of Fire than it would run in alone, and the Regulus procured from the whole is usually brittle and blackish, shewing nothing of the true Colour of the Copper: repeated Fusions are required to bring this to pure Copper. When the Ores contain Pyrites or Marcasite, which is also very frequently the Case, or when they are blended by other Means with Arsenick and Sulphur, or with any of the Semi-metals in a very large Degree, they are to be freed from these heterogeneous Substances by repeated, and those very gentle Calcinations, and toward the End some fat Matter, as Tallow or the like, is to be thrown in and burnt among them, after this they are to be treated as the others. There is indeed a Method in which I have sometimes succeeded so well as to melt these troublesome Ores into a Regulus at one Operation, by means of a Stratification with Charcoal, but this is not easily done, and the Regulus is brittle, when it is thus produced, and requires many Meltings before

fore it comes to be pure Copper. There must be three or four Fusions to bring it to the State of what the Miners call black Copper, and this is very well known to be far from pure malleable Copper, and to require much Pains to bring it to that State. It is owing to this Difficulty of working all the Copper-Ores, that the Metal bears so high a Price: they are frequent and cheap enough, but they must generally go through eight, ten, or more Processes before the Metal can be procured pure and fit for Use.

There is a Method of discovering Copper in its Ore without the Trouble of repeated Processes by Fire, which will hold good in regard to all the Ores in the World, except those few very poor ones, where the Copper is locked up as it were in the Body of Stones whose Basis is Crystal; this Method is by Means of Aqua Fortis. Throw a Piece of an unknown Ore into this Menstruum, and sometimes with, sometimes without any Effervescence the Copper it contains is in part taken up by the Menstruum. The Solution in this Case usually appears green; but in some Ores, in the mullein Copper of *Cornwall* for Instance, it becomes only of a deep brown: Throw a small Quantity of any volatile Alkali, such as the Spirit of Sal Armoniac, into this Solution, and if there be but the smallest Particle of Copper in it the whole becomes immediately of a deep Blue. Copper may also be discovered in the Pyrites in which it is sometimes contained by only exposing that Body to the Air after a slight Calcination, then boiling it in Water, and dipping a Piece of polished Iron in the Liquor, if there have been any Copper in the Body it will shew itself here by precipitating on the Iron, and giving it a true Copper Colour: Water alone is a sufficient Menstruum to the Solution of Copper when in the State of Vitriol, as it must have been in this Case. Copper when mixed with the other Metals, Iron only excepted, is very easily separated from them by Eliquation. As they all meet with a smaller Degree of Heat than this Metal, it is only necessary to keep the mixed Mass a proper time in a Heat not quite sufficient to melt it, and all the rest will run from it, and leave a spongy Cake of Copper alone, which once melting will bring to its proper Form again. If Copper be desired more than ordinarily pure, we are to remember that the whole thing requisite is the separating it more and more perfectly from Sulphur; and this is best done by melting it many times with a fixed Alkali, or with Nitre or Borax. The last of these is said to be the Salt by Means of which the *Japonese* make Copper so very pure, as we receive it sometimes from them.

As to the Virtues of Copper they are far from trivial ones, though it is a Medicine that must not be given internally in any Form, unless under the Direction of a very cautious Physician. Crude Copper like crude Mercury may be swallowed in great Quantities with perfect Safety; it is returned again unaltered, Nature having furnished us with no Menstruum within our Bodies, that is capable of acting on it. It is much otherwise in regard to its Preparations, they are generally esteemed poisonous, but this is carrying the Terror of them too far. Copper in any Form is an Emetic, a violent, and an instantaneous one. A single Grain of the common Verdigrease is an immediate Vomit working as soon as swallowed, and therefore in Cases of Poison just taken, where the first Business is to throw it up again, nothing is so efficacious. The *Ens Veneris* of Mr. Boyle made with Copper and Sal Armoniac,

is also an excellent Medicine, and *Butler's* Stone, and *Helmont's* celebrated Remedy are both Preparations of it.

We find that even Foods suffered to stand long in copper Vessels, acquire an emetic Quality, and when they have been carelessly left in them so long as to have taken up much of the Verdigrease they produce into them, they sometimes bring on a Multitude of bad Symptoms besides, such as Tormina of the Bowels, Cholicks of the most excruciating Kind, and even bloody Stools. Larger Quantities of any Preparation of this Metal bring on Ulcerations of the Intestines, Difficulty of breathing, spasmodic Contractions of the Limbs, and even Death at last, in its most terrible Appearances.

The Antidotes to the Poison of Copper are the same that are to be used against corrosive Sublimate or Arsenic. Milk, Oil, and melted Butter are to be immediately given in great Quantities, and Vomiting provoked by large Draughts of warm Water; Glysters are then to be given with Oil and other unctuous Substances, and after these Cordials and Corroborants; and if the Patient escapes, a Milk Diet for some Time.

The Preparations and Recrements of Copper in use at present, or famous for the Virtues ascribed to them by the ancients are these. 1. *Flos Æris*, or the Flowers of Copper. 2. *Ærugo Æris*, or Verdigrease. 3. *Æs ustum*, or burnt Copper. 4. *Squamma Æris*, or the Flake of Copper. 5. The *Ens Veneris* of Mr. Boyle. 6. *Aqua Sapphirina*, a famous Eye Water of a blue Colour.

FLORES ÆRIS,
Flowers of Copper.

This was a Medicine much used externally among the Ancients, but now quite disregarded. It is prepared by melting a Quantity of common pure Copper, and throwing Water on it just as it begins to cool. This must be done only in small Quantities, for the Effect of cold Water on melted Copper is terrible: in this Process it makes the whole Mass of the Metal break into small Granules which are collected, and are what are called *Flores Æris*, though somewhat improperly. The Ancients used this among drying Powders to prevent sweating offensively under the Arms or at the Feet, but the suppressing these Evacuations is a very dangerous Practice.

ÆRUGO ÆRIS,
Verdigrease.

This is a Preparation of Copper that is still in frequent Use on many Occasions. It is properly no other than that Metal dissolved by a mild Acid into the Form of an *Ærugo* or Rust. After pressing the Grapes for Wine, the Husks, Stones, and other Refuse are laid to be dried in the Sun; they are then moistened with the strongest Wine that can be had, and laid together in large Vessels till they begin to ferment; after nine or ten Days this Matter is press'd and work'd into Balls between the Hands, and these are laid in an orderly Manner over the Bottom of an earthen Vessel, and as much Wine is laid over them as will cover them half way up. The Vessels are then covered with a loose Lid, and set in a Cellar, where the Balls are left in the Wine about fifteen Hours, a Person turning them four or five times in that Space, in order to make the Wine soak perfectly through them; after this some wooden Bars are placed across the Vessel about half an Inch above the Surface of the Wine, and the Balls are laid out of the Wine upon these: the Vessels are then shut up, and the

the whole left in this State ten Days or more. At the End of this Time, the Balls emit a very penetrating Scent, and are fit for dissolving Copper. They are now to be broke to Pieces, and the Outside mixed with the internal Part which is moister, they are then laid with thin Plates of Copper *Stratum super Stratum* in the same Vessels upon the Bars, and the whole is left for a Week or Fortnight, at the End of which time the Plates are found covered with Verdigrease, which is not taken off immediately, but they are wrapped up in Cloths wetted with Wine and laid by a Week or more, and then the *Ærugo* or Verdigrease is taken off for Use.

This Rust of Copper is rarely ventured internally, nor ought it to be, unless in the most desperate Cases, where an instantaneous Vomiting is necessary. Externally it is much used as a Detergent and Desiccative. It eats off fungous Flesh in Ulcers, and mixed with Honey is used in *Aphthæ* and Ulcerations of the Mouth. It is the Basis of what is called the *Ægyptian* Ointment, and of many other Compositions in the same Intention.

This Preparation of Copper seems to have been known to all Nations, and almost at all times, though not prepared as exactly as is now done; indeed wherever there was Copper in Use, the very Effects of a damp Air could not but point out a Verdigrease to People. The *Greek* Physicians called it *Ios* and *Xystos*, the *Arabians* *Ziniar*.

There is a Preparation of this *Ærugo* of Copper in some Use at present both in Medicine and in Painting, which ought not to be omitted here. It is called, though very improperly, distill'd Verdigrease. It is a Crystallization of Verdigrease, prepared thus.

Bruise to a coarse Powder some fine green Verdigrease, pour on it distill'd Vinegar to the Height of three or four Inches over it in a Cucurbit of Glass, set this in a moderate Sand Heat, and shake and stir it about frequently. The Liquor will acquire a beautiful green Colour. Pour it clear off, and add more Vinegar to the Remainder, continue to do this till the Liquor will no longer extract any Colour from the Mass. Evaporate or distill these Liquors all mixed together, till a Pellicle covers the Surface, then set it in a Cellar, and it will shoot into fine green Crystals. Evaporate the Remainder of the Liquor, and set it to shoot again till no more will be produced. These are the Crystals of Verdigrease, improperly called distilled Verdigrease. They are better than the crude Substance for eating away proud Flesh. A Solution of them in common Water is an excellent Detergent for old Ulcers, and they are used in Eye Waters to clear away Specks and Films.

These Crystals distilled in a Retort afford, after a useless Phlegm is come over, a noble Acid, the richest that can be procured from Vinegar. It is called by the chemical Writers *Acetum Esuriens*: it is greatly celebrated for its Virtues as a Menstruum, and is worthy great Praise, though not equal to all is said of it.

*Æs Ustum,
Calcined Copper.*

This is a Preparation somewhat analagous to the *Plumbum ustum*. Take thin Plates of pure Copper and stratify them in a Crucible with a Powder prepared by mixing together two Parts of crude Sulphur, and one of common Salt.

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34 FLAKES, or SCALES of COPPER.

Place the Crucible in a reverberatory Furnace, and give it a red Heat for an Hour. When it is cool the Sulphur will be found consumed, and the Copper calcined into a brittle Matter of a rusty Iron Colour on the Outside, and red within, and of a shining or glittering Appearance. It is drying and astringent, and is used in old Ulcers, either sprinkled on them in fine Powder, or mixed in Ointments.

SQAMMÆ ÆRIS,
Flakes, or Scales of Copper.

This Preparation of Copper only differs from the former in that the Metal is calcined alone here, not mixed with any other Substance; these Scales being no other than the Flakes which fly off from heated Copper when struck with a Hammer. They are drying like the former, but less acrid.

AQUA SAPPHIRINA.
The blue Eye Water.

Pour a Pint of Lime Water made strong and fresh into a Copper Vessel, add to it a Dram of crude Sal Armoniac, and throw in some Filings or small Pieces of Copper, let it stand till it have acquired a beautiful blue Colour. This is a very easy Solution of Copper, and is used as an Eye Water, as also to deterge old Ulcers; and sometimes is mixed with other things in Injections in Gonorrhœas.

ENS VENERIS BOYLEANUM,
Mr. Boyle's Ens Veneris.

Take of the Colcothar of blue Vitriol well calcined and washed two Ounces, crude Sal Armoniack four Ounces, mix these together and sublime the Flowers in a double Vessel: return these Flowers upon the Caput Mortuum left in the Bottom of the lower Vessel, do this three times and save the Flowers last raised for Use. These are commended greatly as a Cure for the Rickets in Children, but we do not know that any Body has fairly experienced them of late: they are certainly a good Detergent, and may be of Use in Injections in Gonorrhœas.

We ought not to close this Article of Copper without observing that *Boerhaave* assures us he once cured an inveterate Dropsy with small Doses of a Solution of Copper in Spirit of Sal Armoniac, but he frankly confesses the same Medicine fail'd him afterwards.

CHAPTER IV.

ARGENTUM,
Silver.

SILVER is heavier than any of the Metals except Gold and Lead; tho' it comes after Lead in regard to its Gravity it greatly excels it in Fixity, and of all Metals approaches much the nearest to Gold in Simplicity; bearing all the Tests of Fire, and most of the severer ones by the Addition of other metalline Bodies in the same manner that Gold does, and not discovering any Diversity of Parts by the ordinary Means. It is considerably hard in Comparison of Lead or Gold, yet it is malleable and ductile to a very great Degree, and may be drawn out into an extremely fine Wire. It is less capable of Rust than any other Metal except Gold, but it readily becomes black on being rub'd with Sulphur: it is
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in some Degree sonorous in itself, and in Composition with Copper and Tin it makes a Metal that is much more so than those two Metals alone would do.

It requires a kind of middle Degree of Fire to fuse it, bearing unaltered a stronger Heat than either Lead or Gold, but melting much more easily than Copper or Iron. It may be strictly said to grow red hot before it melts, but the State of Ignition without Fusion is but instantaneous in it; this Metal always running as soon as ever it is seen to be red hot. It amalgamates readily enough with Mercury: the readiest way of mixing them is to have the Silver in fine Filings very clean from Grease, and to rub it in a Mortar with the Mercury. It is fix'd in a common Fire so as to lose scarce any thing, perhaps truly speaking not any thing at all in the fiercest Degree of it ever so long continued: it has been tried by *Boerhaave* for two Months together in the Eye of a Glass-house Furnace, and found to lose only one twelfth Part of its Weight in the Operation; and it is highly probable that even this Loss might be owing to the Silver's not having been perfectly purify'd first. I have purify'd Silver to that Degree that it seems to have been above all Loss. I have not indeed had Opportunities of repeating the *Boerhaavian* Experiment, but I have found it so fix'd as to lose not the hundredth Part of a Grain in the utmost Violence of the Fire of my own Furnaces, during a very long Continuance of a Heat capable of melting Iron.

Silver expos'd to the fiercer Fire collected in the Focus of a large Burning-Glass immediately becomes red hot and melts, it then crackles, and afterwards emits a thick Smoak: soon after this is covered with a dusty Substance or Calx. If the Silver have been refined by means of Antimony this Calx is of a yellowish Hue, and if kept long enough in the Focus it will vitrify in the same manner as Gold, but if it have been refined with Lead the Calx is whiter, and *Homborg* assures us will never vitrify however long exposed even to that Degree of Heat.

The specific Gravity of Silver has been variously laid down by various Experimenters, this has been owing to the different Degree of Purity of the Silver they have weigh'd, or their different Accuracy in Experiments of this Kind; they make its Weight to Water to be from 10284 to 11091 to 1000, by the nicest Trial the Gravity of the Silver I have already mentioned as standing the Fire without loss, is to Water as 10470 to 1000.

Silver is purify'd by means of Lead, and bears its Action without Loss. Fused with Antimony if the Effect be not carefully prevented it turns to Scorix and becomes volatile: there is no Metal indeed except Gold alone that bears the Test with this rapacious Mineral in the common way.

The proper Solvent of Silver is Aqua Fortis, it is dissolved readily by this, and not at all by the common Aqua Regia; yet under certain Circumstances Aqua Regia will dissolve Silver: the first Phlegm which arises in the distilling that Menstruum, when newly made, and when it has been some time in Digestion with Gold, will dissolve Silver and will not touch Gold tho' it cannot but be acknowledged that this Liquor is as much Aqua Regia as what follows in the Distillation. This however is a mere Experiment of Curiosity not likely ever to occur in the way of Business, and in that Respect, tho' we are acquainted with this Accident, which was discovered by Chance by *Homborg*, we may say in general, as we used to do, that Aqua Fortis dissolves Silver and not Gold, and Aqua Regia Gold and not Silver. If but the smallest Quantity of Sea Salt be put into Aqua Fortis it will no longer give a clear Solution of Silver, this gives us a

Test for the Goodness of Aqua Fortis; and to this Difference in the Effect of these two Menstrua we owe the only Method of separating Silver from Gold without Loss.

If Silver be fused with Lead it loses its Sound and its fine bright white Colour; if melted with Tin it becomes extremely brittle, and the two Metals are very difficultly separated again. It melts and mixes easily with Copper, and by that means acquires a Hardness which fits it for our Coins and Utensils much better than it is in its pure natural State.

Silver melted with Arsenick (which is easily done by mixing the Arsenick with Chalk and a little Tartar, then wetting it with common Water, and then stratifying the Silver with the Mass) receives a Part of that Substance into its own Body, and shews the singular Effect it has on it in its losing all its Malleability; but the Arsenick may be separated from it again by only melting it in a strong Fire.

Silver melted with Bismuth is afterwards much the more easily amalgamated with Quicksilver; and what is yet more remarkable, is, that it by this means becomes so attenuated that it will pass thro' a Leather in much larger Quantity mix'd with the Mercury than it would otherwise have done. It is made much more fusible as well as volatile by Antimony, and is strangely debased by the Fume of burning Sulphur.

Silver is said by some to be able to colour the natural Gems and the factitious Glasses and Pastes with a fine Blue, but this is an Error wholly owing to the Alloy of Copper, which is in most Silver, and which has occasionally shewn this Effect in the artificial Products of this Kind: as to the supposed Effect in the natural ones we have no adequate Proof of it, no Silver having ever been separated from any blue Gem, nor any Proof of its being in any of them having appeared to me in all the Experiments I have occasionally made. Tho' Silver in the Earth be not capable of communicating any Colour to Fossils, it has however a Power of influencing their Figure, and that in a very singular Manner: It has long been known that Iron determines the Crystals it enters the Composition of, as already observed, into Rhombs, and Lead into Cubes, but it has not been known that those truncated Crystals and Spars, preserved as great Curiosities in the Cabinets of the Curious, owe their Figure to Silver till I lately separated Silver from them. As certainly, therefore, as Iron or Lead can form Crystal into Cubes and Rhombs, so certainly can Silver, even in a very small Quantity, influence the Figure of those Fossils, and form them into Columns truncated at each End.

Silver is more frequently found native than in the State of Ore; what are usually call'd Ores of Silver being truly no other than Masses of Stone of various Kinds, in which are bedded great Quantities of native malleable Silver: it is lodged in these in form of Filaments or Flakes, or else in thick and shapeless Masses, and is not only found in this Manner in Stone, but in Sands and Earths also of many Kinds: in Sands it is usually met with in small Grains, in Earths in larger Pieces, and those beautifully ramose, but that in Stone is the most elegant of all, often running in Veins of a very singular Figure, and frequently filling the thin Fissures of its Matrix with flat Plates ridg'd and furrow'd in a surprisingly beautiful Manner.

Silver tho' most frequently found in these Forms is however very often met with, and that in large Quantities, in the true State of Ore, its Substance being
penetrated

penetrated by Sulphur and Arsenick, which are the two Minerals that reduce all Metals to the State of Ores. In this Case it has nothing of its genuine Appearance, but is often found in Form of a soft and malleable Substance of a blackish Colour, looking so like Lead that it has been mistaken for native Lead : Some more debased Masses of this Kind are also met with of a paler or greyish Colour, these usually contain Copper as well as Arsenick with the Silver and are not malleable : another Form of the Ores of Silver is in Masses, of the Size and Shape of Pebbles, and of the Colour of coarse Amber, these break with a slight Blow, and are frequently found to contain two thirds of their Weight of Silver ; the former, however, are richer than these, and often contain no less than thirteen Ounces of pure Silver in the Pound Weight.

There is finally another yet more beautiful Ore of Silver than all these, this is of a fine bright glowing red Colour, and is sometimes found in rude Masses, but not unfrequently in regular and elegant Crystalline Shoots, and is equal to many of the red Gems in Beauty.

Beside these, which are Ores peculiar to Silver, it is not unfrequently found in very considerable Quantities mixed among the Ores of other Metals. All the Lead-Ores of *England* contain some Silver, some of them so much that they are work'd for it to great Advantage. The Cobalt and Antimony Ores also frequently contain some Silver, and the whitish and grey Copper Ores usually have a great deal of it. These are the more usual and determinate Appearances of Silver in its simple or mix'd Ores, but beside these it is found in many other accidentally varied Forms. Stones of all Colours and Consistencies are indeed worked in different Places for the Silver contained in them.

We have some of the black malleable Silver-Ore in *England*, where it has been usually mistaken, as in many other Places, for native Lead ; but there never have any Quantities of it been met with. The *German* Mines in general afford Silver : some few of them have it native, but in the far greater Part it is found in the State of Ore of the red or of the black malleable Kind. *Norway* has Silver in considerable Abundance, most of it native and lodg'd in a debased Crystalline Stone, approaching to the Nature of the Agate or Onyx. The *Hungarian* Mines afford native Silver in some Quantity, it is there usually of the capillary Kind, and is lodg'd in a whitish Stone. The *Saxon* Mines afford it most frequently in Spangles like those of Talc, native and lodg'd in a reddish fissile Stone, sometimes in a grey one : the Ores, as they are call'd, of *Peru* are Masses of native Silver in Stone, usually very beautifully disposed.

It is not to be supposed that it is here meant to determine, that the Ores of Silver thus mentioned as most frequent in the several Kingdoms where there are Mines are the only ones produced there ; it is only meant that what are here described are the most frequent and universal in those Places : the Red and the Black are found more or less in all the *German* Mines where there is any Silver at all, and the Red frequently embodied in or cover'd with the Black.

The Stones containing native Silver, and improperly call'd Silver-Ores, are usually very rich, and part with the Metal the most readily of all other Substances that contain it, by Amalgamation : they are to be powdered, and roasted if necessary, then washed to carry off the lighter Matter, and Quicksilver is to be added to the Remainder to take up the Metal, which is to be afterwards separated by distilling away that additional Matter. As to the Ores of Silver properly

perly so call'd, if they be easily fusible, the Silver is conveniently separated from them by means of Lead, with which it mixes in the Test, and from which it is to be separated by burning away the Lead in a Copell. If the Ore have unmetallic Earths among it, from which no washing will separate it, a little Glass of Lead is to be added to scorify them the more readily. If it contain Pyrites it is to be roasted till it smokes no longer, nor emit any Smell, and then treated in the common Manner.

The Chemists who suppose Silver to have some peculiar Affinity to the Moon therefore call it *Luna*, their Character for it is this D , by this they mean to denote the half of Gold, whose Character is a compleat Circle, the inner Line of this Figure, if turn'd outward, would make it the compleat Mark of Gold, by which they express that the inside of Silver turn'd outward would make it Gold, for they do not allow that there is any thing foreign or corrosive in this Metal, as there is in all the others except Gold itself: this corrosive Matter they express by a Cross added to the Figure which is wanting only in the Characters of Gold and Silver. It has been supposed by many that Silver would afford a blue Tincture, but this is wholly erroneous; its Solution, if the Silver has been thoroughly purified, is always colourless, and its Crystals are as pellucid and destitute of any Tinge as the purest Rock Crystal; but if there be any Copper left in the Silver, even in ever so small a Quantity, the Solution will be Green or Blue. The Crystals of Silver are intensely Bitter. If Silver be melted with common Salt it blends with proper Management into a semi-pellucid Mass, call'd *Luna Cornea*, which is very difficultly reduced into Silver again, being so volatile that it flies wholly off in a small Degree of Heat.

The Chemical Writers have said great things of the Virtues of Silver, but there is very little Reason for placing any Dependence on them. The *Arabian* Authors are as fond of it indeed as they are of Gold, and attribute all those Effects to a Grain or two of it taken internally, that a sufficient Quantity of it is apt to create in the Possessor without swallowing any of it. They say it gives great Spirits and Cheerfulness, and fortifies the Heart, and add, that it is in a particular manner good for the Head. Hence they give Leaf Silver a Place in all their strengthening and cordial Compositions, and hence the Chemists have endeavoured to introduce among us a long Train of Lunar Medicines, such as *Argentum Potabile*, *Diaphoreticum Lunare*, *Bezoar dicum Lunare*, and fifty others as pompous as insignificant.

The only Preparations of Silver which keep up their Credit in the Shops, are the Lunar Crystals and the Lunar Caustic.

Crystals of Silver.

Melt an Ounce of pure Silver in a Crucible and pour it into a Vessel of cold Water in which it will be buried eight Inches deep; the Silver falls into the Water with a hissing Noise, and is divided into small Granules, this is call'd granulated Silver. Dry this Silver and put it into a glass Vessel with two Ounces of Aqua Fortis, it will perfectly dissolve and disappear in it: the Liquor will be clear and of an intollerably bitter Taste when diluted, a little Quantity of a black Powder usually separates to the Bottom of the Glass which is Gold, it not being easy to find Silver that does not contain some of that Metal. This is to be kept under the Title of a Solution of Silver, it is a violent Caustic, the least Drop of it eating away any Part of the Skin that it touches. It eats down
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the callous Lips of Ulcers, and immediately takes away Warts and the like Excrescences. This Liquor also properly apply'd on an Agate or other hard Stone sinks into it in a regular and determinate Way, and leaves a lasting Mark fix'd deep in the Stone of a brownish red Colour, which if it fades in keeping is always to be restored to its full Strength, by exposing the Stone to the Air; this is the Secret of the *German* who drew Portraits on Agates here some Years ago. A Secret that may be carried much farther since I have found the means of sinking two or three other Colours from Solutions of other Metals, as deep into the Stone as this unpleasant one given by the Silver.

To return to our Subject; put into the Solution of Silver just described fresh Silver in small Pieces so long as it will dissolve any, when the last Piece or two remain untouched, the Solution is at the highest Point of Saturation. Set it in a cool Place and it will immediately begin to shoot into fine pellucid Crystals, which are to be separated by pouring off the Liquor, or if the Solution of Silver in the Quantity of one Ounce to two of the Menstruum be evaporated and set to shoot, the same sort of Crystals will be found, but they will be yet more acrid than these, as containing a larger Portion of the Acid.

These Crystals of Silver are like the Solution an immediate Caustic, they burn the Skin on the slightest Touch, and always leave a black Spot upon the Place; these are only us'd as Caustics: but there is another Kind of Crystals of this Metal prepared for internal Use, and call'd by the fanciful Writers of the Chemical Tribe, *Luna Hydragoga*. These are made by a Solution of Silver in Aqua Fortis as the former, but when they are taken out of the Liquor they are dissolved in Water, and an Ounce of purify'd Nitre being added to the Solution of the Crystals produced from an Ounce of Silver, the Liquor is set to crystallize again, and the Crystals taken out and dry'd for Use.

These are a violent Purgative, they are given in Dropsies, and by some are recommended in Palsies; their Dose is from three to eight Grains.

LAPIS INFERNALIS.

The Lunar Caustic.

This is usually prepared from an evaporated Solution of Silver, but it is much better made from the Crystals of Silver first described, in the following easy manner. Put the Crystals of Silver into a clean glass Vessel, set it over burning Charcoal and let the Crystals melt, when no more Smoak arises from the melted Matter pour it out of the Glass into little cylindric Cavities form'd in Clay, or into any thing else that will give it an oblong Form. As soon as the Matter is cold take it out of the Mould, wrap it in some warm'd Paper and dry it thoroughly in it, then wipe the Surface and put it up into a clean and dry Bottle and cork it well up. It will keep thus many Years: it is a very powerful Caustic, eating away the Flesh and even the Bones it is applied to, only moistening the End of it first.

The pretended Tinctures of Silver we have already observed are only Tinctures of the Copper, and are therefore not to be ventur'd internally; every colour'd Tincture of Silver may be boldly declared to be of this Kind; and as to the colourless ones we have not heard that they have any Virtue.

The only Preparation of Silver we shall add, is, that Liquor kept by many as a mighty Secret for tinging Hair of any Colour to a fine Black.

Take three Drams of crude Mercury, dissolve it in an Ounce and half of Aqua Fortis, add to this two Ounces of the Solution of Silver already described, pour the whole into a Vessel of clean Water so much in Quantity that the whole may not be able to corrode Copper nor raise Bubbles on its Surface. This is the most certain of all Proofs that the Liquor has its due Strength, and when it has stood by about a Month, it may be used with Safety.

CHAPTER V.

STANNUM,

Tin.

TIN is the lightest of all the Metals: it is remarkable for a Quality that no other of them has, which is, that when bent it makes a crackling Noise. It is somewhat harder than Lead, but less so than any other of the Metals: it is malleable in a very considerable Degree, tho' less so than Lead: it may be drawn easily enough into a coarse Wire, but if this be attempted to be brought to any great Degree of Fineness it snaps and breaks under the Workman's Hands.

Tin is less susceptible of Rust than most of the other Metals: it is very little elastic, and scarce at all sonorous.

It melts with a much smaller Degree of Fire than any other Metal, a Heat but a little greater than that of boiling Water being sufficient to fuse it. It melts before it grows red hot like Lead; and so much less a Degree of Heat, even than that requisite to the running of Lead, is necessary to the fusing of this Metal, that it may be easily separated from the other by Eliquation; and if the Fire be kept under a mix'd Mass of the two, so low as to be just not enough to melt the Lead, the Tin will all run off from it.

Tin amalgamates very readily with Mercury and may be mixed in Fusion with most other Metals, and as readily separated from any of them again by the beforementioned Process of Eliquation. It is the least Simple of all the Metals, being brought by a very small Degree of Fire to emit sulphureous Flames; these are plainly the absolute Sulphur of the Metal: they do great Injury to the People employed to work upon it and render them pale, and often absolutely destroy them. The Consequence of the emitting these Fumes so abundantly is that Tin of all Metals loses most of its Weight and calcines most easily in the Fire. Exposed to the Focus of a great Burning-Glass it immediately melts and sends off a large Quantity of a thick white Fume, the remaining Matter is then a fine white Calx: if this be continued longer in the Focus it runs into a pellucid crystalline or glassy Matter in Form of Needles, these if held ever so long in the same Heat undergo no farther Change, never running into a Mass of Glass as the Remains of most of the Metals do under the same Circumstances; but like the Glasses of the other Metals, if exposed again to the same Heat laid on a Piece of Charcoal, they immediately run into Tin again; and the same thing happens if it be continued on the Tile or Copel it was first placed on in the Focus, and some fat Matter, as Tallow or the like, to be added to it.

Filings of Tin thrown into the Flame of a Candle take Fire and render the Flame Blue, emitting a visible Fume and a Smell of Garlick: melted in a Crucible with a Mixture of Nitre it deflagrates. Its constituent Matters therefore

seem to be a crystalline Earth which melts with great Difficulty, and an inflammable Sulphur, in which from its Smell while calcining, and from its poisonous Quality, it is probable there may be something of Arsenic mixed.

The specific Gravity of pure Tin is laid down by Authors from 7156 to 7617, to 1000 to that of Water. The purest Tin I have been able to prepare appears by the nicest Examination to be to Water as 7350 to 1000.

Tin so far endures the Force of Lead and Antimony in the Refiner's Test, that it is hardly to be separated from them unless by the Addition of Copper: it adheres to the rest of the Metals with greater Ease than any other, and hence is of continual Use in covering Plates of Iron, and lining Copper and other Vessels to prevent their rusting, and to save the Liquids put into them from taking up any bad Qualities from those Metals, as it is much more difficultly dissolved by common Menstruums than either of them.

Tin in many Things greatly approaches to the Nature of Silver. It very readily melts with Silver, Gold, or Copper; when the Mixture is made with equal or even a less Quantity, it renders them extremely brittle. But it is very singular that if it be mixed in a much larger Quantity they still continue pliant and flexible. Ten Parts of Tin and one of Copper make a Mass more rigid indeed than Tin, yet malleable and ductile. Silver of all the Metals suffers most by an Admixture of Tin, a very small Quantity of it serving to make that Metal as brittle as Glass, and what is worse, being very difficultly separable from it again. The Addition of about one tenth Part of Copper to Tin, makes it fit for the common Uses of Life in Vessels of various Kinds, as it becomes by the Mixture more durable; a little Zink added to this Mixture gives the Metal a yellow Colour, and as it is mixed in greater or less Quantity makes it fit for casting of Cannon and for Bells.

Iron readily mixes with Tin in Fusion if the Fire be very brisk, and the Iron heated white hot before the Tin be added: twice the Quantity of this Metal added to Iron so heated readily runs with it into an odd Substance, which is very white and brittle, and readily answers to the Magnet. This has been used by some with a Pretence of its not being Iron, and that the Loadstone would attract another Metal beside that. But the Fallacy is easily discovered by any one that understands any Thing of metallurgic Analysis.

Lead bears a considerable Admixture of Tin without being affected as Gold and Silver are, which are both rendered brittle by it, at least its Effects on this Metal are in a much smaller Degree. The very Vapour of Tin has the same Effect with the Metal itself on Silver, Gold, and Copper, rendering them brittle. Many a Metallurgist has been long plagued with these Vapours by a Piece of Tin being accidentally among his Charcoal; the Consequence of which has been, that till it was burnt wholly away these Metals have been rendered brittle as Glass under the Hammer, by only being fused over these Coals. It is owing to this Property of Tin, in making the Metals it is mixed with brittle, that it makes them sonorous. Mr. Boyle has expressed a Wonder that Tin, which is itself not much sonorous, should on Mixture with Copper render it more so; but if we consider that the same Sort of Disposition of Parts which renders Metals rigid and brittle, renders them sonorous, the Mystery is explained.

The proper Solvent of Tin in its true malleable State is *Aqua Regia*. It will not dissolve well in any of the other Menstrua of the stronger Kinds, nor indeed very readily in this. We are not to wonder however at this Difficulty of Solution in Tin, since we find it contains much more Sulphur than any other Metal, and Sulphur is not one of those Substances that are to be dissolved by Acids. That this is a Fact we find by putting calcined Tin, instead of common malleable Tin, into Solution, for in this Case even Vinegar will dissolve it. While Tin is in its malleable State the weakest Acids dissolve it best: Verjuice, and it is said even four Apples boiled in tin Vessels, acquire a Taste of that Metal, though the strongest Acids, *Aqua Regia* excepted, boiled in the same Vessels acquire no Flavour from it at all.

Many of the chemical Writers have been of opinion, that if the Sulphur could be thoroughly purged from Tin, it would be no longer Tin but Silver. It is certain that the two Metals have many Things in common: if dissolved in *Aqua Regia* Tin is bitter, as well as Silver in Solution with the nitrous Acid: but the Crystals which are produced from a Solution of it in Vinegar after it has been calcined for eight and forty Hours together, which is a necessary Step toward such a Solution, (and which one would think should bring it nearer to Silver than before, if the dissipating its Sulphur were the Way to do it,) differ wholly from those of Silver. We have indeed Accounts in many Authors, of Tin being made to yield a large Quantity of Silver by peculiar Processes; but that careful Experimenter Mr. Boyle tells us, that all Tin is not to be expected to yield these Advantages in the same Manner, for that himself had separated pure Crystals of Silver from one Parcel of Tin by a peculiar Menstruum, but that another Parcel of the same Metal would not answer in the same Manner.

Though Tin and Lead readily unite in Fusion over a gentle Fire, if the Heat be afterwards raised to a violent Degree, there is a visible Motion excited in the Mixture, and the Consequence is that both are reduced to a Calx, and the Lead becomes extremely difficult afterwards to vitrify.

The Effect that Zink has upon a Mixture of Tin and Copper, the Copper being in a larger Proportion than has been usually given in such Mixtures, is little known, and seems to be a Secret that the People who are possessed of it, intend to make of Use to them. I have made a mixt Metal by these Means, which has not been discoverable, even by the Workmen, from some famous Metals lately brought into Use in Imitation of Gold.

Tin when it mixes itself with Crystal in the Earth, influences both its Figure and Colour. It gives it a pyramidal Form consisting of four Sides, short and with a broad Base, and at the same time usually communicates a yellow Colour to it with an Admixture of a dusky brown, which makes it much inferior to the yellow Crystal made so by Lead. Even the Tin Grains, though very different Substances from the Crystals we are describing, have something of this yellow Colour, which appears when they are broke into small Pieces, tho' in the Mass they are opaque and blackish. In the making of the artificial Gems, there is a Method of obtaining this Colour from Tin, and communicating it to Glasses. It seldom succeeds indeed in the common Way of doing this by Lead, but in Vitrifications, where the Basis is Borax, the Calx of Tin properly treated with Vinegar yields Crystals, which will communicate the true Colour of the browner Topazes to the vitrify'd Mass. I preserve a Specimen

cimen of this Vitrification scarce inferior to the finest Topaz in any Thing but Hardness.

The Ores of Tin are very various, as it is found blended with all Kinds of Substances, with marcasitic, crystalline, and stony Matter, and even with other Metals. The *Germans* have lately talked of finding native Tin in the perpendicular Fissures of some of their iron Mines; but there seems no Foundation for the Opinion. I received a Specimen of what they call by this Name, with a very pompous Account of it from one of the People in the Neighbourhood of the Mine where it was found: but this pretended native Tin wanted the first of all the Characters of a native Metal, Malleability. It broke to Pieces under the Hammer, and on Trial in the Fire, proved to be a marcasitic Ore, very rich indeed in Tin, a very singular and valuable Substance, but not as pretended, native Tin. This remarkable Ore is found in Nodules from an Ounce to three or four in Weight; it is of a bright silvery Colour like the white Arsenical Pyritæ, but covered with a coarse dusky Crust: when properly worked, it is the richest Tin-Ore I have met with. I have separated five Drams of pure Tin from the Ounce of it.

The next Ore to this in Richness, and that which has consequently been usually accounted the richest of all, is the *Tin Grain*, or *Lapis Jovius*. This is an Ore of Tin, of a fine glossy black Colour on the Outside, but in thin Pieces held up against the Light, it is transparent and yellowish; it is the heaviest of all the metalline Ores, and is of a very irregular Figure, but in the finest Pieces it seems to approach to the Shape of those Crystals which are formed of two Pyramids joined Base to Base, without any intermediate Column. In Size it is from the Bigness of a large Walnut down to that of a Pin's-Head; for of that Minuteness we meet with some perfect Tin Grains. The largest Quantity of Tin I have ever been able to separate from these, has been four Drams and a half from the Ounce, which sets them a little below the former Pyritical Ore in Value, so that it is much to be wished that Substance may be found any where in Plenty. After the Tin Grain we are to mention a black and very heavy Tin-Ore of an irregular Figure and metalline Appearance; but this, though it promises very fairly by its Weight, seldom yields so much as half a Dram of Metal from the Ounce in its crude State; if washed indeed, and all the foreign Matter carried off, it may be reduced almost to the Purity of the Tin Grains before the Working.

The Tin-Ores of *Germany* usually contain a very large Quantity of Iron; ours are free from this Admixture, and are greatly the more valued for it. Our other Ores of Tin, besides the two above described, are a brownish or blackish stony one, very hard and heavy: this is debased by a great Quantity of the stony Matter, and requires careful Washing before it is brought to the Fire; and a yellowish or whitish Ore, which are less heavy and more brittle than the others, and contains a large Quantity of common Sulphur: and to these may be added another, in which the Metal is yet more mixed with Sulphur; this is the Mundic found in the Tin Mines which is very bright and shining, of a Silver or gold Colour, and often contains a large Portion of Tin, though it be very difficultly separable from it, because of the Abundance of Sulphur in the Mass. We have also a red Ore of Tin, of a stony, and sometimes of an earthy Nature, and carrying so little of the Appearance of an Ore of this Metal,

tal, that it is hard to guess what could lead any Body to work it in Expectation of it. It is however very rich.

Tin-Ore is sometimes also found mixed with that of Lead, and carrying the external Appearance of Lead only : some of these Ores are neglected in *France*, where they might turn to a very considerable Account under proper Management. The *German* Ores of Tin are usually so like those of Iron, that at first Sight it is scarce possible to distinguish them. We are also finally to add to the Number of the Tin-Ores the dodecahædral Garnets sold by our Druggists ; these are in general irregularly figured, but the most regular of them always consist of twelve Sides ; they are of a deep red Colour, and are in Size from the Bigness of the largest Pea, to that of the Head of a small Pin. These are truly Ores of Tin, of the Nature of the Tin Grains, but not so rich ; I have separated from some of them two Drams of Metal from the Ounce, in general however they contain but an inconsiderable Quantity.

There is something very singular in the great Gravity of Tin-Ore, beyond that of the Ores of other Metals ; but it contains so much Arsenic, and is so dangerous to the Person who works it, that Experiments are not to be expected to be made very frequently on it. The Tin-Ores in general are stubborn and refractory in the Fire ; it is easy however to find whether an Ore does or does not contain this Metal ; for if a Piece of it be powdered and washed, and afterwards sprinkled thinly over an iron Plate made white hot on the Fire, the Tin-Ore in this case, if there be any in the Mass, will be found in little Parcels of a red Colour covered with grey Flowers of an arsenical Smell. The various Kinds of Mundic common in the *Cornish* Mines are not only rejected from the Works as Ores themselves, but they are carefully separated from among the other Ores of a better Kind, as they are apt to be very troublesome even in the smallest Quantities in working the rest. They then pound and wash the Ore, and when they have thus separated all the lighter Impurities, they burn or roast the Remainder on iron Plates, continually stirring it till there is no longer any Smell of Sulphur or of Garlic ; after this they grind it to a tolerably fine Powder, and after washing it again it is carried to the melting Houses, where it is run into Metal by mixing it with Charcoal, and urging the Fire to the utmost Violence by Blast of large Bellows. There is a Cavity at the Bottom of the Furnace into which the Metal runs as it separates from the Ore, and out of which they let it by an Aperture closed and opened at Pleasure ; running it into Cakes or Pigs which are the large Blocks we see it in.

Tin-Ore in general contains a great Quantity of Arsenic, which discovers itself in the roasting in Form of a white Cloud, and which it is very material to burn quite away, as it otherwise renders the Metal brittle. Charcoal alone commonly serves for the fluxing the Ore of Tin, but if any be found very refractory a little common black Pitch is an excellent Addition.

Tin is the Metal described by the *Greeks* under the Name of *Cassiteron*. The *Latins* who took it for a Kind of Lead call'd it *Plumbum Candidum*, calling the common Lead *Plumbum Nigrum*. The *Arabian* Writers have named it *Alanne* or *Alaserub*. The Chemists call it *Jupiter*, and all the Preparations of it *Joviales*. The Character they use to express it is this Ψ , by which they mean to denote that it is one half Silver or *Luna*, and the other half corrosive, which they express by the Cross added to the Crescent. Mr. *Boyle* indeed was of Opinion

pinion that Tin and Silver were the same Metal, only that in the State of Silver it was pure, and in that of Tin debased by the Admixture of some corrosive Matter not to be separated from it. This however is too much of the Alchemical Doctrine to be received at this time of Day.

The Virtues of Tin, as a Medicine given internally, have been greatly celebrated by the Writers of many past Ages, but it has less Credit at present. We have been told that in Diseases of the Lungs and in Disorders of the Head and Uterus there is scarce any thing equal to it; and that in Convulsions, Epilepsies, and the Madness arising from the Bite of a mad Dog, it was a certain Remedy. These last are the only Cases in which it has any Degree of Credit at present, and that is rather among the Vulgar than among Physicians. In Epilepsies we have known half a Dram given twice a Day for a long Time, but without Success. In the Bite of a mad Dog, great Cures of the preventative Kind have been said to be wrought by it, but it is not easy to say, before the Symptoms in that terrible Case appear, whether the Poison took Effect or not.

In the Manufactures it is of great Use in Solders, and when amalgamated with Mercury, and a little Bismuth added to make it run thin, it serves in the Silvering of Looking-Glasses. By Calcination it makes a soft Powder called Putty, which is of Use in the polishing Glass and Gems, and also in the making of Enamels.

Its Preparations in Use in Medicine, or generally kept in the Shops, are these, 1. The *Stannum Pulveratum*, or powdered Tin. 2. The *Sal Jovis*, or Salt of Tin. 3. The *Diaphoreticum Joviale*, or Antihectic of *Poterius*, and 4. The *Aurum Musivum*, or as it is commonly called, *Mosaicum*, Mosaic Gold.

STANNUM PULVERATUM,

Powdered Tin.

Let a Quantity of Tin be melted and poured into a wooden Box, the Inside of which has been chalked all over. Let the Box be shook briskly about till the Tin is cold, and being then opened a Part of the Metal will be found reduced to Powder; let the remaining solid Lump be melted again and treated in the same Manner, till it be all reduced to Powder. This is a Sort of Granulation of Tin, and is a much better Preparation of it when it is to be given internally, than the common one of coarse Filings. This is said to be a Remedy for Worms, and is given by some with that Intent, a Scruple at a Dose every Day for a long time: but we have not any certain Accounts of its good Effects.

SAL JOVIS,

Salt of Tin.

Calcine a Quantity of pure Tin in a flat earthen Vessel in a gentle Fire for three Days and Nights often stirring it about, and keeping the Fire as equally as may be of the same Degree. Pour on the calcined Powder in a glass Cucurbit as much distilled Vinegar as will cover it four Inches deep: give it a Heat a little less than that of boiling, and continue this four or five Hours, then pour off the clear Liquor and evaporate it till a thin Pellicle appear upon it. Set it in a cool Place, and there will shoot Crystals very pellucid, colourless, hard, and solid; these are to be separated and the Liquor farther evaporated and set to crystallize again. This is a tedious and nice Process, many have failed in it, but with proper Caution it will always succeed. The long

long Calcination of the Tin and gentle Evaporation of the Solution are two very essential Points. The Gentlemen who are in Search of the Art of transforming Metals have great Expectations from this Salt, but they have not yet performed any of the Miracles they pretend to with it. In Medicine it is recommended in hysteric Cases to be given from two to four or five Grains for a Dose. But possibly its Virtues in this way are as imaginary as in the other; however it be, it is very little known among us at present.

DIAPHORETICUM JOVIALE, SIVE ANTIHECTICUM POTERII,

Diaphoretic Tin, or the Antihectic of Poterius.

Melt in a good Crucible equal Quantities of Tin, and of the martial Regulus of Antimony, cast them while in Fusion into a conic brass Vessel a little heated and greased on the Inside with Suet. Beat off the Scorix and there will remain a pure Regulus of Tin. Mix one Part of this Regulus of Tin with three Parts of crude Nitre, heat a Crucible red hot and throw into it while in the Fire this Mixture, a Spoonful at a Time: let them calcine together, and finally pour the whole into a Vessel of Water a little heated. Pour off this Water, and wash the Matter several Times with fresh warm Water; there will remain at the Bottom at length a greyish white Powder with some Cast of Blue in it. This is the *Diaphoreticum Joviale*.

It is greatly commended for taking off the Acrimony of morbid Humours, and is given in Hectics, in Consumptions, and in Hæmorrhages of all Kinds, but particularly in Spittings of Blood. The Dose is from five Grains to thirty.

AURUM MUSIVUM,

Mosaic Gold.

Take Tin one Pound, Flowers of Sulphur four Ounces, crude Sal Armoniac and purified Quicksilver of each half a Pound. Melt the Tin, and while it is in Fusion add the Quicksilver. When all is cold reduce it to Powder, and thus mix with it the Sulphur and the Salt. Sublime the whole in a Matrafs. The *Aurum Musivum* will be found under the Part sublimed with a small Quantity of Foulness at the Bottom.

Canparius, in his Book *De Atramentis*, gives the original Recipe for this Preparation of Tin, but he adds the other Ingredients all in equal Quantities; the College Dispensatory gives these Proportions, and the Process succeeds much better thus. *Geoffroy* even orders the Mercury in one fourth a larger Quantity than the Tin, but this is not necessary, though we have tried the Process in his Proportions, and found it succeed not amiss. The *Aurum Musivum* is prescribed in malignant Fevers, and in hysteric and hypochondriac Complaints with Success. Its Dose is from ten Grains to twenty. The Painters also use it for a gold Colour.

To these Preparations used in Medicine, we may add one well known as a Colmetic: this is a Magistery of Tin prepared in the Manner of that of Bismuth. Take six Ounces of Spirit of Nitre, and one Ounce of Spirit of Sea-Salt. Mix them together and they become a Kind of *Aqua Regia*. Into this Liquor put Tin in small Quantities till the Menstruum is not capable of holding any more; the Solution will be thick and oily; pour it into six or eight Quarts of spring Water and the Tin will be precipitated in Form of a white Powder, this is to be washed in several Waters and then dried.

This

This Calx is very difficultly reduced to Tin again by the Force of Fire. It is used by the Ladies in Pomatums to render the Skin white and soft, and some have recommended it internally as a Diuretic, but this is not very warrantable.

CHAPTER VI.

AURUM,

Gold.

GOLD is the heaviest of all Metals, and consequently of all known Bodies. The Chemists tell us that it is composed of two Substances, the one an extremely pure and simple Matter of the Nature of Mercury, and the other, which they say fixes or destroys the Fluidity of this, an equally pure and simple Substance, extremely subtil and of the Nature of Sulphur. We are to take all this however upon the Credit of those who affirm it; for by all the Trials that have been made, Gold seems the most simple of all known Substances. Its Colour is yellow, it is the most malleable and most ductile of all the Metals. It is wholly incapable of Rust, and is not sonorous when struck upon*. It requires a strong Fire to melt it, remaining unaltered in the Degree of Heat that fuses Tin or Lead, but running with a less vehement one than is necessary to the fusing of Iron or Copper. It does not retain its Colour till the time of its melting, but becomes ignited and white before it runs, and when in Fusion it appears of a pale bluish green Colour on the Surface.

It amalgamates the most readily of all the Metals with Quicksilver; when in a State of Fusion it very easily and very intimately blends itself with Silver, and when mixt with that Metal will also run into a Mass with Iron. Either Silver or Gold may indeed be mixed singly with this Metal by Fusion, but it is much more easily done with regard to Gold when before blended with Silver. It much more easily mixes with Copper and the other Metals, and very readily with some of the Semi-metals, as with the Regulus of Antimony. Common Fire carried to its utmost Vehemence has no farther Effect on Gold than the fusing it, it will remain ever so long in its fiercest Heat, and come out at last unaltered and with its whole Weight. Exposed to the Focus of the strongest burning Glasses, it sparkles and flies off in small Masses, which if received on Paper and examined afterwards, are found to be pure unaltered Gold; but if that Heat be managed very nicely, and the same Gold again and again exposed to it, it is affirmed that a Part of the Gold will at length go off in Fumes, and the Remainder will be found to be a Substance of a deep Blue with some Admixture of Purple, and approaching to the Nature of Vitriol rather than of Gold, of which it wants the Malleability and the specific Gravity.

* It is not easy to conceive how so accurate a Writer in general as the late Mr. Geoffroy should have happened to give the Quality of being sonorous to Gold as one of its Characteristics *aurum Metallum est omnium nobilissimum maxime ductile, sonorum, &c.* Truth, Reason and Experiment all deny it.

Gold is greatly the most divisible of all Bodies : if melted with a hundred thousand Times its Weight of Silver, it will perfectly and equally blend itself with that Metal ; any Grain of the melted Mass being cut off, will be found on assaying to contain its due and proportionate Quantity of the Gold in it ; and a single Drop of a Solution of Gold in *Aqua Regia* will communicate a metalline Taste to a Pint of Spirit of Wine if mixed with it. Its Ductility is in no Degree inferior to this Quality of it. The Wire-Drawers, according to *Reaumur*, are able to extend a Leaf of Gold to the twelve millionth Part of an Inch in Thinness over a flattened Silver Wire, and yet the Silver shall be so perfectly covered in every Part with Gold, that not only the naked Eye, but even the best Microscope shall not be able to find a Speck of Silver appearing under it.

The Specific Gravity of Gold has been said by different People who have experimented it, to be to that of Water, from 19081 to 19640 to 1000 ; according to the nicest Experiments I have been able to make with Gold refined to the utmost Purity in my own Furnaces, it is as 19420 to 1000

The proper Solvent of Gold is *Aqua Regia* ; this Menstruum owes its Power upon this Metal to the Sea-Salt it contains, that being almost the only Salt which has the Quality of acting upon Gold. The Effect of this Menstruum affords us one Test for this Metal ; if we require another we may have recourse to a Fusion with Antimony : for if pure Gold and Antimony be melted together, the Antimony on keeping up the Fire to a great Height will be all driven off in Fumes, and will leave the Gold, if pure, unaltered in Weight ; whereas if it contained any Mixture of another Metal, the Antimony would have taken it away with it, not excepting even Silver itself.

If a Quantity of Salt of Tartar or any other fixed Alkali be thrown into a Solution of Gold, the Metal is precipitated in Form of a Powder, which has an explosive Power greater than that of Gun-powder, or the *Pulvis Fulminans* of the Chemists. This Powder is called from its Property *Aurum Fulminans*.

Gold is usually found in the Earth native and not debased into the State of Ore, but under its own proper Form, yellow, malleable, and ductile. In this State however it is seldom quite pure, but usually contains some Copper and almost always some Silver among it. Native Gold thus mixed with small Quantities of the other Metals, is found sometimes in small Granules among the Sands of Rivers, sometimes in larger Masses loose and alone, or else mixed among a reddish or whitish Marle in the Fissures of Rocks. But its most usual Form of all is that in which we see it, in what is vulgarly, though very improperly, called Gold-Ore ; that is in Masses of a whitish opaque Stone approaching to the Nature of Crystal, in which the native Gold is disposed in Form of Drops and Threads, and sometimes of Veins. The Gold in this Stone has a thousand various and beautiful Appearances, and the Stone itself is occasionally tinged with black, green and other Colours. There are also coarser Stones of various Kinds and Colours, in which Gold is dispersed in this Manner, all which are beautiful enough, but less so than this purer kind ; these are of all Colours, but most frequently they are whitish or reddish. In all these Ores as they are called, the Gold shews itself in its proper Form : but there are some Metalline Substances found in which this Metal is truly reduced to the State of Ore,

Ore, that is in which it is not yellow, malleable, or ductile, but reduced to a discoloured and brittle Mass by being penetrated with Sulphur or Arsenic, and by them reduced like the other Metals to that State which is properly called Ore; these being the two Substances which Nature employs to debase the other Metals into that State. Whenever Gold is found thus penetrated and altered however, there is always Silver with it in the same Mass, and the Ores are properly Silver Ores or those of some other Metal in which some Silver is also contained, the Gold being always in the smallest Quantity of any Metal in the Mass.

Among the number of Gold Ores we are also to reckon *Lapis Lazuli*, some Pieces of which, beside the glittering gold colour'd Marcasite that abounds in them and forms their yellow Veins, containing also a small Quantity of Gold. Common Sand and Clay may also be reckoned among the Ores of Gold, as there are few Kinds of either from which some Gold may not be extracted by a skilful Hand, tho' not enough to pay the Expence of working. Common Orpiment has also been worked near two thousand Years ago for Gold, and a small Quantity obtained from it, but not enough to make it worth while to continue the Works; and finally some of our common Marcasites contain a little of it. The Colour of our yellow Marcasites has tempted many to believe them almost all Gold, but such People may be easily undeceived, by only calcining the Substances they suppose so rich in a common Fire, in which Case they do not retain their yellow Colour as Gold would do, but become Red.

Gold resisting the Action of Lead, or Glass of Lead, and sustaining the Copel and the Test in which other Metals, Silver alone excepted, turn to Scorix, is easily separated from its Ore, as well that which is properly as that which is improperly so call'd, by the common Method of Testing and Copelling.

When in its native State it is also very conveniently separated by Amalgamation with Mercury, as it more readily mixes with that Body than even Silver itself does; but this Method is of no use where the Gold is truly reduced to a State of Ore, as nothing but a pure Metal is capable of Amalgamation.

The ready Method of separating the Gold from its Ore by the Copel, is to mix a Quantity of it in fine Powder with eight times its Weight of granulated Lead, and putting it into a Test, in which keep it red hot till the Scorix on the Surface are perfectly vitrify'd: after this the Lead with the Gold separated from the stony and other Particles and mixed with it is to be put into a Copel and kept in the Fire together till all the Lead is burnt away into Litharge and Scorix, and the Gold remains alone in the Copel. When the Ore is mix'd with other Substances besides Stones or earths, as Pyrites and the like, a little Glass of Lead is to be added which makes them run thin and more easily, deposit the Metal by Precipitation. These Methods will succeed when Gold is truly in a State of Ore, but when it retains its metallic Form, tho' mix'd with Stones and the like, the short Way is that by Amalgamation. The Method for this is to powder the Ore, then wash away the lighter and fouler Part, infuse the rest in strong Vinegar with a little Alum dissolved in it, and afterwards pouring off the Vinegar and washing the Ore with Water, it is to be dry'd and then rubb'd in a Mortar with four times its Weight of Mercury, till all the Gold be taken up by the Mercury; as much of the loose Mercury as can be is then to be separated by straining the whole thro' a Cloth, squeezing it well, and after this the Remainder of it is to be
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separated

separated by Distillation or Evaporation, and the Metal left behind is to be fused with Borax till it is quite pure.

When there is Gold and Silver together in the remaining Mass of Metal after any of these Operations, they are to be separated by putting the whole into Aqua Regis, and when that Menstruum has dissolved all the Gold it is to be evaporated away, and the Gold remaining at the Bottom to be melted in a Crucible with Borax: the Silver remaining undissolved by the Menstruum is to be melted in another, and both will be pure and in their proper Form. Finally Gold mix'd in a Regulus with any of the other Metals is readily separated from them by fusing the whole with three or four times the Weight of Glass of Lead.

It is to be observed that Aqua Regis, tho' the general and common Solvent of Gold, is not the only one: *Kunkel* long since discovered that it might be dissolved by the Fumes arising from a Mixture of Oil of Tartar and Oil of Vitriol, and a Menstruum in the common Liquid Form may be produced from these, which will have the same Power. Mercury also is a true Solvent of this Metal by Amalgamation; and the *Hepar Sulphuris*, or Liver of Sulphur, on being fused with it, takes it up so perfectly that it will be carried into a *Lac Sulphuris* by the common Processes afterwards with it, without any Separation either in the Solution or Precipitation.

The chemical Character to express Gold is a Circle with a Point in the Center thus \odot . They intend this as the Symbol of Perfection and Simplicity, the Circle being the most uniform of all Figures, and comprehending the greatest Space under the smallest Superficies.

The Virtues of Gold in Medicine, however highly extoll'd by some Writers, seem altogether Imaginary. The *Greeks* never paid much Respect to it in this way: *Geoffroy* tells us that they never used it in Medicine at all. *Auri usus in Medicina olim Græcis fuit incognitus*; but he is mistaken in this, for *Dioscorides* prescribes the Filings of this Metal to those who had swallowed Mercury. It first got Footing as a Medicine among the *Arabians*, and we find them ordering it beat into thin Leaves as an Ingredient in many of their Compositions. They tell us that it is a Cordial, and that it has great Virtues against Palpitations of the Heart, nervous Complaints and Melancholy. The Chemists go much farther, and talk of an *Aurum Potabile* as a sort of universal Medicine; but there seems no great Credit to be given to any thing that has been said on this Head: indeed whatever have been call'd Tinctures of Gold have been only Fluids, in which that Metal has remained suspended in its metalline State only in small Particles, and from all which it may be separated by Evaporation and Fusion.

The present Practice therefore allows its Use as an Ornament only to Medicines, not as a Medicine itself. The only Preparation of it that ever has been received on the footing of a Medicine by rational People, is the *Aurum Fulminans*, and that has been of late prov'd to be a very mischievous one.

AURUM FULMINANS.

Take four Ounces of Aqua Fortis and one Ounce of common Salt, mix them together and they will make an Aqua Regis of a yellowish Colour. Set some of this Liquor in a Sand-heat, and dissolve in it as much Gold as it will take up, which is a little more than a fifth Part of its own Weight. When the Gold is dissolved, pour the Solution off from the black Powder, which will remain at the Bottom

Bottom if any Silver was contained in the Gold, and into this Liquor drop Oil of *Tartar per deliquium* till there is no more Ebullition. The Gold will then be found precipitated to the Bottom in Form of a yellow Powder: this is to be separated from the Liquor by Decantation, and wash'd several times with Water and then dry'd very carefully by a gentle Heat. The Powder thus prepared is more in Quantity than the Gold that was employed by one fourth of its Weight. If it be heated beyond a certain Degree, which is a very mild one, it goes off with a loud Explosion, and this whether the Heat be given it by Fire or by only rubbing it too violently. This Effect is prevented by adding a larger Quantity of Oil of Tartar than is necessary in the Preparation, and if melted with Flower of Brimstone and the Sulphur burnt off, it also loses this Property and becomes of a purple Colour.

This Powder has been given internally as a Sudorific and Cordial, and many have boasted of it as a Cure for Fevers; but it is found often to bring on terrible Cholicks and many other fatal Symptoms, and ought to be wholly banished out of Practice.

Tincture of Gold, or Aurum Potabile.

We have observed above that there can be no such thing as a true Tincture of Gold, but those who are desirous of having this Metal in so divided a State in a Fluid as to approach toward the Form of such a Medicine may make it thus.

Dissolve any Quantity of pure Gold refin'd with Antimony in twelve times its Weight of Spirit of Salt, add to it half the Quantity of the essential Oil of Lavender, Rosemary, or the like: shake the two Liquors together and then let them stand till the Oil separates to the Top; it will have acquir'd the yellow Colour that the Menstruum had, and is to be then pour'd off and mix'd with four times its Quantity of Spirit of Wine; let these stand together till they have acquired a purple Colour.

This is supposed to possess the Virtues of a Cordial and Sudorific, but in reality if it have any such they must be owing to the essential Oil, the Gold can contribute nothing to them, for it remains still Gold, and may be separated in its own proper Form by mere Evaporation.

Gold is capable of tinging transparent Substances to a fine red Colour. The Ruby evidently owes its glowing Red to this Metal, as Gold may always be separated from the Fragments or useless Granules of this Gem. In the artificial Imitation of these elegant Bodies the same Effect is also produced: The fine Filings of it fused with Borax, with the Addition of a small Quantity of Salt of Tartar and crude Nitre, give a fine tho' not deep Red to that glassy Matter which results from this, as from all other Fusions of Borax. If one Part of Gold and five Parts of pure Tin be calcined together they form a Powder, a few Grains of which thrown into a Composition made of red Lead and Crystal, run together to Vitrification, give the Glass the true Colour of the Ruby, and if more be added the Colour will become deeper and even purplish, resembling the paler Amethysts. The same Effect will also be produced by a Precipitation of Gold from a Solution in Aqua Regia, by adding a Solution of Tin.

The chemical Writers all tell us, that Gold calcined with Antimony has also this Effect, but we have not found this succeed nearly so well upon Trial.

Numberless have been the Attempts to convert other Metals into Gold, but as these are all lighter than that Metal, and as nothing is so hard to give by Art as Gravity, they have been hitherto, and are likely always to be without Success.

The Degradation of Gold seems very nearly as difficult as the making it. Some industrious People have indeed gone so far toward this as to bring Gold to a State in which no reducing Fluxes they were acquainted with would get it to itself again, but this is no Proof that others might not have been invented that would have done it. The Vapour of Phosphorus indeed in an odd manner calcines Gold into a sort of unmalleable Matter of the Appearance of a Calx, and the same thing may be done by a long and gentle Calcination of Gold that has been amalgamated with Mercury, but we have been able to reduce Gold in this State, produced by either means, into pure and malleable Gold again.



F O S S I L S.

F O S S I L E B O D I E S

Used in M E D I C I N E.

C L A S S the S E C O N D.

S E M I - M E T A L S.

AFTER having celebrated the Metals for their Virtues, and for the many Preparations with which they furnish the Shops, we are to observe that the Semi-metals furnish also as great a Number in Proportion; and these yet more efficacious, and less to be spared than even those produced from the Metals themselves.

When we say this, we mean to include under the Class of Semi-metals, Mercury, or Quicksilver, a Body so different from all others in Nature, that the Writers on these Subjects have been puzzled where to range it; but if Malleability be, as is universally allowed, the grand Criterion of *Metals*, and if those Substances which approach to their Nature in many respects, but want that great Character, are properly call'd *Semi-metals*, as is also as generally allowed, surely there can be no Dispute among Men of Science about the Class of Bodies to which this fluid Mineral belongs.

We understand by the Term Semi-metals, metallic Fossils, heavy, opaque, of a bright glittering Surface, and not malleable under the Hammer.

Of these we only know five Kinds, which arranged according to their medicinal Merit, will stand thus:

1. QUICKSILVER, with its Ore *Cinnabar*.
2. ANTIMONY.
3. COBALT, with the *Arsenics*
4. BISMUTH.
5. ZINC, with its Ore *Calamine*.

To these adding the Semi-metallic Recrements, Tutty, Pampholyx, &c. we have before us all that the Semi-metals furnish the *Materia Medica* with.

C H A P T E R I.

HYDRARGYRUM,
Quicksilver.

QUICKSILVER is a naturally fluid Mineral, and is the heaviest of all known Bodies next to Gold. Its fluid Nature renders it incapable of Malleability, and tho' many People have pretended at different times to fix it and render

der it solid, and agree to tell us that it is then malleable and ductile to a great Degree, we are apt to believe that no such Change was ever fairly made in it, but that all who have pretended to be able to do it, have either deceived themselves, or have attempted knowingly to deceive the World. Mercury is always the more heavy and the more fluid as it is the more pure; and is of so perfectly homogeneous and simple a Nature, that it is a Question whether Gold itself be more so: when perfectly purify'd we find it the same in all its Parts, as far as our utmost Tests can go, till we come to that severe Trial the solar Fire. It penetrates the Parts of all the other Metals, renders them brittle, and in part dissolves them. It is wholly volatile in the Fire, and may be driven up in Vapour by a Degree of Heat very little greater than that of boiling Water. It is the least tenacious of all known Bodies, for its Parts separate into more minute ones of the same Figure with the smallest Force, and every smaller Drop may be again divided by the lightest Touch into a Multitude of others, and so on as far as our Senses are able to trace them. It is indeed the most divisible of all Bodies, the Vapour in Form of which it rises in Evaporation, is too thin almost to be distinguished from the ambient Air, yet this is pure unaltered Mercury; for if received into cold Water it forms itself into regular round visible Drops again.

Mercury very readily mixes with Gold, Silver, Lead, and Tin among the Metals, and with Zink and Bismuth among the Semi-metals. Copper it will also mix with in the same Kind of Amalgamation, but with more Difficulty; and the remaining Metal, Iron, it is said by some to be immiscible with; but all that these Authors should affirm on the Subject is, that they have not found the Means of bringing such a Mixture about. If there be any thing of the metallic or semi-metallic Kind that seems absolutely to refuse an Union with this fluid Substance, it is the Regulus of Antimony.

Of all the Metals it unites the most readily and the most perfectly with Gold, next after this with Lead, then with Silver, Tin follows these, as easier of Amalgamation than the remaining ones. A little Bismuth added to these Amalgamations is of great Assistance; it makes the Metals penetrated by the Mercury flow much thinner than they otherwise would, so that much of them will pass thro' Leather with the Quicksilver. The other Assurances to Amalgamation are in the Management. The Mercury must be quite pure, and the Metal reduced to the smallest Particles that can be, then it is to be heated as far as the Mercury will bear, without being dissipated, and both are to be rub'd briskly together in a Mortar for a long Time. The Metal and the Utensils employ'd must necessarily also be very clean, and particularly there must be nothing of an unctuous, nor any thing of an alkaline Nature suffered to come near them. Mercury however perfectly blended in this manner with any of the Metals, may be easily separated by Distillation, in which Case it comes over into the Receiver in its own Form, and leaves all the metalline Matter behind in the Retort.

Notwithstanding that a small Heat serves to evaporate Mercury, yet if it be kept in a Degree smaller than that in a Vessel carefully clos'd, a long Continuance of that Heat will reduce it to a red Calx in Form of Powder, and this may again be revived into fluid Mercury, by a gentle Heat given it in Stratification with Charcoal Dust. If it be laid in its crude State in the Focus of a great Burning Glass, it is immediately dissipated in Fumes and leaves no remainder.

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but if instead of crude Mercury, this red Calx, or as we improperly call it, *Precipitate per se*, be us'd, it runs into a kind of Glass, and immediatly afterwards evaporates, leaving a small Quantity of a dusky Powder behind, which on being farther urg'd by the same intense Heat vitrifies and flies off as the other Part had done: but if this Calx be expos'd upon a Piece of Charcoal, the Effect is the same as in the giving it the Heat of a common Fire with Charcoal Dust; it runs into liquid Mercury and immediately afterwards evaporates. It appears therefore that Mercury, simple as it seems to be, is compos'd of a vitrifiable Earth, and a Sulphur, which last gives it the Brightness and Appearance of a Metal, for that when robb'd of this it ceases to be bright or metalline, and again recovers those Qualities on its being added again, tho' from no other a Substance than Charcoal. This shews also the Error of the Chemists, who from its great Simplicity have esteem'd it a Principle, or one of the primary Elements of Bodies: an Element according to their own Definition of their Terms must be an incorruptible and unchangeable Body, and Mercury when brought to this Trial appears not to be such.

They tell us also that the perfect Metals are only Mercury with its Particles, pervaded and fill'd with the Matter of Fire or Light, but this is Chimera.

It is possible to calcine Mercury to such a Degree that it shall be able to bear heating red hot in a Crucible without Evaporation, this is an Experiment first shewn us by the *French*, and is a very curious but a very tedious one.

The penetrating Power of Mercury is so great, that in Salivations any thing of Gold worn by the Persons will be amalgamated with the Fumes of it passing thro' the Skin, and will be rendered white and soft by it.

The specific Gravity of pure Mercury is to Water as 14020 to 1000.

It dissolves very readily in the stronger acid Menstrua, and what is very singular in Aqua Fortis and Aqua Regia indifferently; whereas the Metals in general that are soluble in one of these, are not to be affected by the other. With Oil of Vitriol it yields us the yellow emetic Powder, call'd Turbeth Mineral, and with Spirit of Sea-Salt Corrosive Sublimate. Mercury being the heaviest of all Fluids is also the coldest: common Water is much more cold to the Touch, under the same Circumstances, than Spirit of Wine, and consequently Mercury than either, and when heated Mercury is in an equal Degree the hottest of all Fluids, that Heat which given to Water would scarce be felt by the Flesh, will burn it if given to Mercury.

Mercury tho' it readily mixes with the Metals, does not easily blend with any other Substance, except by the means of Fire, or of Trituration: by either of these Agents, it may be blended intimately with Sulphur, by the former into a red Matter, by the latter into a black Powder, the *Æthiops Mineral*.

No Drug ought to be so carefully examined as to its Purity as Mercury, as none is so frequently sophisticated. The weighing it hydrostatically is the surest of all Means to find out this Adulteration, as whatever can be mixed with it (Gold excepted, which no body will use for this Purpose) is lighter than it, and consequently it will be the less heavy as the more adulterated: but as the Apparatus for these Purposes is not in all Hands, we may recommend the evaporating a little of it to try if any thing will remain behind. Or it may be discovered when adulterated in the common way with Lead, by grinding it in a Mortar with common Vinegar. This mild Acid is a Menstruum for Lead, tho' not for Mercury,

Mercury, and consequently if there have been Lead mix'd among the Mercury it will grow sweet to the Taste, but if the Mercury be pure it will remain unaltered.

The Ores of Mercury are of various Kinds, but the most general one is known by the Name of Cinnabar, and as this is received in the Shops as a Medicine, as well as the Mercury itself, we shall give its Description singly.

CINNABARIS,

Cinnabar.

Cinnabar is the richest and most valuable of all the Ores of Quicksilver. It is a moderately compact and firm Substance, extremely heavy, and of a bright and beautiful red Colour. It is usually of a striated Texture, but according to the Quantity of Sulphur contained in it, the Striæ still are more or less broad, and in some Pieces they are so fine as not to be perceptible, but leave the Mass with the Appearance of one homogeneous Substance. It is always of a glossy Surface, the most so in the purest Pieces, and in some of the finest of all is transparent and of a most elegant red Colour like a Ruby if examined between the Eye and a strong Light.

Cinnabar is sometimes found in large Masses, sometimes only in small Spangles in Earths or Stones; in the first Case it is one of the best mineral Ores we know for Profit to the Owner, and in the other is often very well worth working, tho' it require the Stones or Earths it lies among to be first powder'd and separated from it by washing.

The Places where native Cinnabar is produced in greatest Abundance, are the Mines of *Friuli*, some others in *Spain* and *Hungary*, and some in the *East-Indies*. It is so rich in Quicksilver that it sometimes will yield more than six Drams of it from the Ounce. The common and poorer Cinnabars are one half at least pure Mercury. Native Cinnabar is to be chosen for internal Use of the brightest Red, the heaviest that can be found, and such as has no extraneous stony or earthy Matter adhering to it: but after all the Directions that can be given about it, it seems best to use the factitious Cinnabar in its Place. This is in Effect the same Substance, compos'd of the same Ingredients, and with no other Difference, but that one is prepared in the chemical Laboratory, the other in the Bowels of the Earth. The factitious has this Advantage, that we know what Proportion of Mercury it has in it, which we never can know more than by guess of the Native, and we are sure also of the former, that it contains nothing but Mercury and Sulphur, which is more than we can always be certain of in regard to the Native.

The Name of Cinnabar, tho' known to the Ancients, was not appropriated to this Drug, tho' they knew this also very well and call'd it *Minium*.

Cinnabar in the time of *Dioscorides* was used to express an *Indian* or *African* Drug, supposed to be the congealed Blood of Dragons; this was probably what we now call *Sanguis Draconis*: in after times however they began to apply this Word to their Minium, and Cinnabar and Minium became indifferent Terms, both apply'd to the Mineral out of which they procur'd Quicksilver, and which was the same with our first Cinnabar. In fine, the Word Minium in succeeding Ages became used for red Lead, and the Term Cinnabar was handed down from them to us as the Name of the Ore of Quicksilver alone. The old *Greeks* call'd it also *Ammon*, and *Vitruvius* *Anthrax*, a Name not very

ill apply'd to such Pieces of it as are redest and most transparent, which when held up against the Light have much the Colour of a fiery Coal, and yet more so of the Gem which the Ancients call'd by that Name.

Native Cinnabar very readily parts with its Quicksilver on being distill'd in a glass Retort, with the Addition of Quicklime or iron Filings. In many Places it is separated with no farther Ceremony than the burying certain earthen Vessels in the Earth, and inverting into them others containing Cinnabar and stop'd with a Bundle of Moss, a Fire being made about these the Quicksilver runs thro' the Moss and is saved in the under Vessel. The Sulphur is not so easily separated from this Mineral in its proper Form, but if it be boiled in a strong Lixivium of Wood-ashes, and distill'd Vinegar be added to the clear Liquor it will be precipitated.

The medicinal Virtues of native or factitious Cinnabar, for they are the same thing when the native is pure, are very great. It is excellent in Epilepsies, and in all Complaints of the Head and Nerves, and it is affirmed by many to be one of the greatest Medicines known in Cases of Madness.

People have been sometimes frightened out of the Use of it by its exciting Nauseas, Vomitings and other Disorders. It would be well if they would be frightened out of the Use of the native Cinnabar by these means, for the factitious will answer all its Purposes, and is not liable to those Accidents which arise from vitriolic, nay, perhaps from arsenical Particles blended by Nature among some of the Masses of this native Mineral.

Cinnabar is, as we have already observed, the principal, the most valuable, and the best known Ore of Quicksilver; but beside this there are several others well known among the Curious; and even native Quicksilver is often met with. It is generally found in its pure and fluid State, lodg'd in the accidental Cavities of hard Stone, and that often in very considerable Quantities: the Workmen can have no guess at the Places where they shall find it in this State, but as they are making their way thro' the Rocks after Cinnabar, and its other Ores, they sometimes break into these Cavities by Accident, and the fluid Mercury runs out like Water. In the same Mines there is also usually found a peculiar Kind of stony or fissile Stone, of a soft Texture and of a blueish Colour in the little Cavities of this Stone, the fluid Mercury often lies in larger or smaller Globules: these are sometimes too small to be seen by the naked Eye, but they are easily separated by pounding the Stone and washing it with Water, on which they all get together, and the Quicksilver is found in a Mass at the Bottom of the Vessel. There are also several Species of Earths, peculiarly a reddish Marl and a pale brown Clay, in which the Quicksilver is found in this manner, and sometimes it is lodg'd thus in the purer crystalline Stones.

Quicksilver however is much more frequently found in the State of Ore than thus native: in this Case its Parts are intimately penetrated by common Sulphur, and it becomes like what we make by subliming Mercury and Sulphur together in close Vessels, a Substance of a solid Form and red Colour, as different in Appearance from Quicksilver as any two Things can be from one another. The Cinnabar pure and in Masses we have already described as the richest Ore of Quicksilver, the poorer Ores are principally compos'd of Cinnabar in small Parcels, lodg'd in other useless Substances of various Kinds. It is frequently found in a blueish indurated Clay, and frequently in a greenish or Olive colour'd stony Stone in
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which it runs in elegant Scarlet Veins, and the whole makes a very beautiful Appearance; sometimes it lies in the same sort of Veins in a white Stone of a crystalline Basis, and which will take high a Polish. Pieces of this cut and work'd as Gems are extremely beautiful.

These and the thousand other Appearances of the Cinnabar, whether in Spots or Stains, or blended among the whole Substance of the Matter it falls into, are of the Number of the Ores easily known at Sight, but there is another in which there is not the least Appearance of a redness; this is a greenish, orange colour'd or blackish Stone, for it occasionally assumes all these Colours, and when broken has very little Brightness, and nothing of the striated Appearance of Cinnabar. From all these Ores the Mercury is easily procur'd by Distillation in large Retorts, with iron Filings, or with Lime: the Retort is to be well coated and should be of a peculiar Form, having the Neck very long and turn'd down at the End, so that the glass Receiver may be apply'd perpendicularly to it, and the Quantity of the Ore put in ought to be so much as will fill two thirds of the Cavity of the Retort: it must be placed so that nothing of the fluid Adherent to the Neck may be able to fall back into the Belly, but that every Particle collected there must necessarily run down into the Receiver. The Retort is to be set on a rais'd Hearth, and a Bed of Sand under it to keep it firm; a Stone is to be plac'd at its Front to support its Neck and to keep the Fire from the Recipient, and the Recipient is then to be apply'd with cold Water in it, the Nose of the Retort being received an Inch or two into the Water. In this State a Fire of Charcoal is to be made about the Retort, at first at a Distance, but by degrees it is to be brought nearer, and the Retort is to be kept slightly red hot for about an Hour: more or less time is to be allowed to this according to the Quantity of the Ore and its Richness, the poorer Ores requiring the greater Heat: when the Vessels are cool'd the Quicksilver will be found at the Bottom of the Water in the Receiver. This Operation may be perform'd in a Sand-heat, but then it is necessary that the Bottom of the Furnace be kept red hot during the Time, and that the Retort immediately touch it; but with this Caution it does not do so well, as the several Parts of the Retort and of the Ore are not equally heated. When there is little or no Sulphur in the Ore there needs no Addition to it, but it runs very readily thus out of the Retort; but when it is of the Cinnabarine Kind Iron or Lime must be added, and the Fire must be made a great deal stronger.

The Chemists Name for Quicksilver is Mercury, and the Character by which they express it is this ☿, by this they mean to express that Quicksilver is Gold in the Middle, Silver at Top, and corrosive at Bottom, the Character being made up of the three Signs which express those Bodies, and accordingly all the Adepts say, that tho' it shews Silver in its Face, it is Gold at the Bottom, whence its Heaviness; but that there is a pernicious corrosive Sulphur adhering to it, whence they can never bring it to Purity. The ancient *Greeks* call'd it *Argyron Cyton*, melted Silver, and Authors of different Ages amongst the *Latins* have named it *Argentum Mobile*, and *Vomica Liquoris æterni*, the *Arabians* *Zaibar* or *Zabach*.

The Ancients all esteem'd Quicksilver a Poison, *Dioscorides* tells us it is so, and *Galen*, who seems to have taken his Word for it, (for he confesses he never had dar'd to try it himself) places it among the corrosive Substances; the Name
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of it does not occur in *Hippocrates*, whence it is probable that it was never used in his Days: In the time of *Avicenna* we find that it was used externally, but never prescribed inwardly; and even at that time it was esteemed poisonous by some. *Aetuiarius* places it among the Poisons; and *Mesue*, though he used it externally, is of the same Opinion as to its inward Use: yet this is wonderful, when they acknowledge that People had frequently swallowed it without Hurt, and voided it unaltered with their Stools.

It is about two hundred and twenty Years since it was brought into internal Use by some, though others even at that time declaimed against it as a Poison. *Fallopianus* gives us the History of this: the Shepherds had ventured to give it their Sheep to kill Worms, and as they received no Hurt by it, it was soon very rationally concluded, that Men might also take it as safely. *Brossavolus* and *Musitanus* gave it about this time to Children who had Worms, they ventured it however only in small Quantities; two, three, or four Grains were a common Dose, and a Scruple the highest they ventured upon: They both declared however that it never did any Harm, and often a great deal of Good. After this the Midwives gave it in the same Dose to Women in Labour, and whatever Good it might do, it was never found thus to do any Harm. *Matthiolus* tells us of greater things in his time: it was then found that the Dose need not be limited to such small Quantities; for that Women had taken a Pound of it at a Time to force an Abortion, and had received no Injury from it. The Diggers of Quicksilver by this time, when they found it crude, would venture to swallow it in vast Quantities, to get it out of the Mines, and sell it afterwards privately when they had voided it by Stool. And of late we have had it recommended so strongly by Dr. *Dover*, in Doses of an Ounce or two, in almost all Diseases, that the whole Kingdom in a Manner took crude Quickilver.

We are not however to imagine that too free a Use of so powerful a Medicine as Quickilver, whether internally or externally, can be always without Danger. We find that the unhappy Creatures who work in the Mines seldom live more than three or four Years, and then die in most miserable Conditions, and the People who work it in any other Manner in Abundance and for a Constancy, are as certain of Mischief from it. Palsies and Tremblings of the Limbs always attend this, and we have had abundant Experience from the common mercurial Unguents, and from the Method of taking it internally, that when proper Care has not been taken the Nerves have been frequently terribly hurt by it, the Humours colliquated, and beside the common Symptoms of a Ptyalism, Ulcers of the Mouth and Throat and Diarrhoeas of the most dangerous Kind have been brought on.

It is to be allowed that under proper Regulation however, it is a most powerful and noble Medicine. Its Virtues in opening the obstructed Passages, and in attenuating tough and viscid Humours in the very remotest Parts of the Body, are superior to those of almost any other Medicine. Whence it is found of great Use in Stoppages of the Glands, in Schirrosities of the Spleen and Mesentery, and in strumous and scrophulous Cases. It is also well known as superior to any thing in the Itch, and other cutaneous Eruptions of the most malignant Kind, and in venereal Ulcers.

The Preparation of Mercury for internal Use in its crude State, has usually been the straining it through a Piece of Leather, but this is not sufficient, for it will carry a small Quantity of Lead with it this Way through the Strainer, especially if the Druggist, who sophisticated it, had the Secret of mixing some Bismuth with it, which attenuates every other Metal in Amalgamation with Mercury in a very surprising Manner. The safest Preparation for this Purpose is the distilling it by the Retort; in this Case there is a Certainty that pure Mercury alone is given.

A very good Method of giving crude Mercury in small Doses is the rubbing it with fine Sugar in a Mortar, with a small Proportion of Oil of Almonds till it is perfectly blended with the Sugar: the Decoction is also given in Cases of Worms; and in Unguents it is the most certain, tho' not the safest of all Cures for Vermin harbouring any where about the Body. Some have ventured to give it in very large Quantities in the Iliac Passion or twisting of the Guts as it is usually called; but though it sometimes has succeeded in this Case, it is a very dangerous Practice, for if the Obstruction be too great for it to break thro' it will do vast Mischief by lodging in such a Quantity in the Intestines.

Crude Mercury is an Ingredient in many of the Ointments and Plaisters of the Shops, and is frequently ordered in extemporaneous Prescription. In this Case the common Method of giving it is in Form of Pills, in which it is killed with Turpentine, and mixed with other Ingredients principally of the purging Kind.

The Preparations of Quicksilver now in Use in the Shops are these, 1. *Æthiops Mineral*. 2. Factitious Cinnabar. 3. Corrosive Sublimate. 4. *Mercurius Dulcis*. 5. *Mercurius Calcinatus*, commonly called *Precipitate per se*. 6. White Precipitate. 7. Red Precipitate, or red corrosive Mercury. 8. Coralline Mercury. 9. Turbith Mineral.

ÆTHIOPIS MINERALIS,

Æthiops Mineral.

Take of pure Quicksilver and of Flowers of Sulphur of each equal Parts, rub these together in a Marble or glass Mortar till the Mercury wholly disappears, and the whole is a fine deep black Powder. This succeeds much better for the Operator if the Mortar be a little warmed, and the Medicine receives no Injury by it. This is esteemed the safest but yet not the least powerful of the Preparations of Mercury. It is a very great Medicine against cutaneous Eruptions, and in scrophulous Cases, in Remains of venereal Disorders, and even in the Gout and Rheumatism it has been given with great Success: in scorbutic Cases scarce any thing is superior to it; and it has been long known as a Remedy against Worms. It may be given in very large Doses up to a Dram or two, though a Scruple is the ordinary Quantity, and may be continued a long time without Hurt, though it is best to purge every three or four Days during the Course of it. It operates by Perspiration, and sometimes by Stool, but scarce ever makes the Mouth sore however largely taken.

CINNABARIS FACTITIA,

Artificial Cinnabar.

Take of purified Quicksilver twenty-five Ounces, of Sulphur seven Ounces, melt the Sulphur, and stir the Quicksilver into it while fluid, if it take Fire let it be immediately extinguished by covering it with another Vessel. When cold

CORROSIVE MERCURY SUBLIMATE. 61

let it be rubb'd to a fine Powder. Let this Powder be put into a subliming Vessel, and setting over a gentle Fire, raise it by Degrees, till the whole is sublimed into a red striated heavy Mass, which perfectly resembles native Cinnabar.

This is a very great Medicine in all the Cases where the native Cinnabar is recommended, and is greatly preferable to it on many Accounts, as before observed. This Receipt for making it, is that of the late College Dispensatory; which, I have found by Trial to succeed better than the Proportions of other Authors, who allow just one third Part of the Weight of the Mercury in Sulphur, which is too much.

MERCURIUS CORROSIVUS SUBLIMATUS, VEL ALBUS,

Corrosive Mercury Sublimate, or white corrosive Mercury.

Take of purify'd Quicksilver forty Ounces, of Sea-salt thirty-three Ounces, of Nitre twenty-eight Ounces, and of calcined green Vitriol sixty-six Ounces. Rub the Quicksilver first with about an Ounce or more of corrosive Sublimate, in a Stone or wooden Vessel, till it be broken into small Grains, then mix with it the Nitre, afterwards the Sea-salt, and rub these together till the Quicksilver quite disappears; then finally add the Vitriol, and rub the whole together a few Minutes to make the Mixture perfect; put the whole into a Matrafs with an Alembic-head and sublime it. The corrosive Sublimate will be found in the Head, and a Spirit in small Quantity will run into the Receiver.

This Preparation of Mercury is a terrible Poison: taken internally it excites the same Symptoms that Arsenic does, and brings on Death in the same Manner, only that it is more speedy in it, corroding every Part that it touches as it goes down to the Stomach. It has its Use however externally, and serves extremely well for the eating down proud Flesh, and cleansing old and foul Ulcers.

The Phagædenic Water used on the same Occasions, is made of a Dram of this Medicine, dissolved in a Quart of Lime-water.

If it be discovered that any Body has swallowed corrosive Sublimate, large Draughts of Oil are to be thrown down and succeeded by Milk and fat Broths, as fast as the Patient can be made to swallow them; then Venice-treacle and other Cordials and Sudorifics are to be given, if the first Shock is got over. It very rarely happens, that Life can be saved after so fatal an Accident, but even if it be, Health is scarce ever restored, but the Patient falls into a Hectic, and dies miserably after his Reprieve.

MERCURIUS DULCIS SUBLIMATUS,

Dulcify'd Mercury Sublimate.

Take corrosive Sublimate a Pound, purify'd Mercury nine Ounces; add the Quicksilver to the Sublimate reduced to Powder, and digest them together in a glass Matrafs in a gentle Sand Heat, frequently shaking the Vessel till the whole is united. When they are thus perfectly mixed, increase the Heat so as to sublime the whole. Take out the Sublimate and scrape off an acrid Part that is found at the Top of it, and if any Globules of Mercury appear separate those also; then powder the Remainder and sublime it again: let this Sublimation be repeated six Times. This, instead of the poisonous Quality the Sublimate had before, is a very safe, and very valuable Medicine. The Chemical Writers call it *Calomel*, *Aquila Alba*, and *Draco mitigatus*. It is a gentle

gentle Purgative, and a very noble Attenuant. It is the greatest of all Medicines against Worms, and is now the general Remedy in a Gonorrhœa; the common Method of giving it is in a Bolus over Night, ten or twelve Grains for a Dose, and a purging Draught the next Morning; or smaller Doses are given nightly, and the Purge only once in two or three Days.

MERCURIUS CALCINATUS,

Calcined Mercury.

This is the Preparation of Quicksilver commonly called *Precipitate per se*, but the late *London Dispensatory* gives it this much properer Name. It is prepared only by setting Quicksilver in a Glass Vessel with a broad Bottom, and a very small Aperture in a gentle Sand Heat, where it is to be kept till it be calcined to a red Powder. A Communication with the external Air is necessary to the calcining of all metalline Substances, but a very small one will do in this Case. The Opening is best made not as in common Boltheads, but at the lower End of a Stem going into the Body of the Glass, that the Quicksilver if it rise by the Heat may not by ascending into the Stem be removed out of the Degree of Warmth that should calcine it. This is a Preparation of Mercury in very great Esteem in all the Cases in which Mercurials are proper. It is given in very small Doses; but for a Continuance. The general Practice at this Time does not allow more than two or three Grains for a Dose, though five or six may very well be taken.

MERCURIUS PRECIPITATUS ALBUS,

White Precipitate of Mercury.

Take of Sal Armoniac and of corrosive Sublimate, each an equal Quantity; dissolve them together in common Water, and filtrate the Solution through Paper. Then add Oil of Tartar *per Deliquium* enough to cause the Matter to precipitate. Pour off the Water and add more fresh Water several Times, when the Powder has been thus perfectly freed from its Acrimony, let it be dried for Use.

This is out of Use as an internal Medicine, though recommended by many in small Doses, in which it purges and sometimes vomits, but is very apt to salivate. At present it is principally used in Unguents for cutaneous Foulnesses, a Dram of it to an Ounce of Pomatum is about the usual Proportion.

MERCURIUS CORROSIVUS RUBER,

The red Mercurial Corrosive.

This is the Preparation which People have been used, tho' very improperly, to call red Precipitate. The late *London Dispensatory* has given it this more proper Name.

Take purify'd Quicksilver any Quantity at Pleasure, put it into a flat bottom'd Glass, and add to it an equal Quantity in Weight of Aqua Fortis. Set the Mixture on a Sand Heat till all the Moisture is evaporated, and the Mass at bottom have acquired a fine red Colour.

The common Recipe given for this Preparation is with Spirit of Nitre, instead of Aqua Fortis, and in a little larger Quantity; but the Surgeons do not find what is prepared in that Manner answer their Purpose. It is of great Use in eating down Carnosities, and destroying fungous Flesh in Ulcers. It is one of the mildest known Escharotics, doing this very certainly, yet with very little Pain.

The

YELLOW EMETIC MERCURY. 63

The famous *Arcanum Corallinum*, so boasted of for its Virtues internally by many, is no other than this Medicine dulcify'd by the distilling Spirit of Wine several Times from a Mixture with it. The remaining Powder is given in small Doses of two or three Grains, and is of a purgative Virtue; but the Method prescribed by the College in their late Dispensatory, of burning away the Spirit after Digestion, is much better than this of the Inventors by mere Distillation. They order three times the Weight of Spirit of Wine to be poured on the red Powder above described, and after digesting them three Days together in a gentle Heat, the Vessel being often shaken in the mean while, they order the Spirit to be fired, and the Powder continually stirred, till it is all burnt away.

MERCURIUS EMETICUS FLAVUS, SIVE TURPETHUM MINERALE,
Yellow Emetic Mercury, or Turbith Mineral.

Put into a Matrafs any Quantity of purify'd Quicksilver, and pour upon it twice its Weight of Oil of Vitriol, set it in a Sand Heat, and increase the Fire very gradually till it boils, keep it boiling till there remain only a white Mass at the Bottom of the Matrafs: then increase the Fire yet more, that this may be perfectly dried. Pour warm Water upon this, and it will turn yellow, and fall to Powder; rub this Powder in the Water in a Glass Mortar; then let it subside, and pour off the clear Water; add fresh warm Water several times, till all the Acrimony is washed away, then dry the Powder for Use.

This is an excellent Emetic in venereal Cases. One Dose of it will at any time do more than half a dozen Purges; but we have almost declined the Use of it of late, from the Uncertainty that has been observed in its Operation, and the dismal Cholicks which have sometimes attended the taking it. Four or five Grains of it used to be a Dose, and never failed operating by Vomit; at present it is hard to say what is a Dose of it; we give eight, ten, twelve, or more Grains, and often without Effect, we mean of the salutary Kind; for such Doses, when they do not vomit often, bring on bad Symptoms. The Fault does not lie in the Medicine itself, but in the Sophistication which the Villany of the present Race of Chemists, as they call themselves, have learned to introduce into it. I have analysed some of the Turbith that I have found fail me in Practice, and have found more Lead than Mercury in it. They have a Way of grinding with it the Colour called by our Painters Masticot, which is Lead calcined to a Yellowness. When I have been at the Pains of preparing Turbith myself, I scarce ever found six or eight Grains of it fail of its true Effect.

CHAPTER II.

ANTIMONIUM,
Antimony.

ANTIMONY is a considerably heavy Semi-metal, naturally running into Masses composed of an infinite Number of Striæ or Filaments. It is softer than any other of the Bodies of this Class; it breaks easily with a small Blow, and is very readily reducible to Powder by only rubbing it in
a Mortar.

a Mortar. It has not the least Degree of Ductility, but it is naturally very bright and glossy, and not much susceptible of Rust. It is not at all sonorous in itself, yet like Tin, which has not that Quality in itself, it is capable of heightning it in other metallic Bodies that are possessed of it. It is easily fused by Fire; a small Degree of Heat answers this Purpose: it flows the thinnest of all the known mineral Bodies; and when urged by a violent Fire, proves totally volatile. It bubbles up in the Manner of Lead when the Degree of Fire is a little greater than what is barely necessary to melt it. It is not only volatile in itself, but it renders all other Substances volatile by Mixture, Gold alone excepted. It leaves this Metal in Fusion clearer and purer than it can be made by any other Means, but carries off every thing else in Vapour with it. Antimony very easily runs into a Glass like that of Lead, which is of the same Use with the Glass of Lead in the vitrifying Earths and Stones; but is even preferable to it, as it attenuates them more, and in a strong Fire carries them off with it in Vapour. It would therefore be very useful in the Fusion of Ores, by the vitrifying and separating the stony Matter, but that it carries the Metal itself also, except that be Gold, away with it. This Glass is very easily prepared by only fusing Antimony with a mineral Substance, commonly known by the Name of Calk, and very frequent in our Lead-Mines: A Lump of this, the Bigness of a Walnut, thrown into a Pound of Antimony in Fusion, vitrifies it almost instantly, and receives no visible Change itself in the Operation.

The Glass produced by this Process is of a dusky brownish Red, and semi-pellucid; wherever Calk is to be had, there is no Way so ready as by this means, to make the Glass of Antimony: where it is not at hand it is easily vitrified alone, by calcining it in coarse Powder to a grey Mass, stirring it that it may not run into Lumps, and then putting this Calx into a Crucible in a strong Fire: the Antimony is thus converted into a Glass, like that of the former Process, but of a clearer Red.

Where Bodies very difficult of Vitrification are mixed among the Matters to be purify'd by Antimony, as is the Case in the more refractory Ores of many Kinds, the Antimony is apt to evaporate away before it has done its Office: This however is easily prevented by only throwing a little Piece of Suet or Tallow into the Matter which keeps it from flying off a long Time. The Regulus of Antimony mixes very readily with the several Metals; most freely of all with Iron, and next to that with Copper. It consists of a large Quantity of a true fossil Sulphur, and a Matter very much resembling the Nature of the Metals, and which, if Art could arrive at any Method of rendering it ductile under the Hammer, would be a true Metal. Mr. Boyle tells us, he knew a secret Process, by which a true fluid Mercury might be obtained from it; and others since his Time have pretended the same Thing, but we have never seen any of them do it. We could know how much Credit was to be given to Mr. Boyle if he had told us the Process. It renders all Metals brittle with which it is mixed; and upon the whole, there seems great Reason from its Effects on these Bodies compared with those of Arsenic, to believe that it is very nearly allied to that poisonous Mineral, tho' it do not exert the same fatal Power in the Body. The whole Difference between the two Substances seems to be, that the Arsenic is fixed in Antimony by a vitrifying Earth.

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The Ores of Antimony are very numerous and very various in their Form, Colour, and Figure. It is pretended by many, that Antimony is often found pure, in its perfect State in the Earth; and the Cabinets of Collectors hold so many Substances under the Name of native Antimony, that it should seem almost absurd to deny the Existence of such a Fossil. I can only observe that of all the Specimens I have seen preserved as native Antimony, I never met with one that would bear the Test, and prove truly such: and to silence the Claim that such a harsh Assertion may raise among the Gentlemen who are proud by it of some of the greatest Glories of their Cabinets, I may add, that I have seen the very finest of the Substances preserved under this pompous Name, resembling the wrought Antimony in their grey Colour and striated appearance, and specimens of Manganese.

Antimony is found reduced to the State of Ore by Sulphur and other extraneous Matter, and as these are blended with it in greater or lesser Quantities, it has more or less of the external Appearance of wrought Antimony, and is thus by its external Appearance arranged by Collectors in the Class of native Antimony, or of Antimony-Cres.

The most usual Ore of Antimony is a hard and ponderous Substance of a blueish grey Colour, not striated as common Antimony, but composed of a Number of small irregular Granules, which appear very bright and sparkling wherever the Mass is fresh broken. This Ore has much the Appearance of a bright Piece of cast Iron where fresh broken.

Other Ores of Antimony, in which there is less extraneous Matter, are formed of broader and flatter Granules, these more nearly resemble the wrought Antimony but are more brittle: these are very bright, of a paler grey than the Granules of the last mentioned Kind, and the Ores composed of them are more beautiful and more valued.

When there is yet less of the extraneous Matter, and that is almost pure Sulphur, the Ores approach infinitely nearer than either of these to the Appearance of wrought Antimony. They are composed of Multitudes of fine and slender Filaments of a bright and glittering steel Colour; these are laid more or less closely together in the several Specimens, and are much broader and coarser in some than in others. These are properly enough called striated Antimony-Ores; but the Generality of People who collect Minerals loving sounding Names, they are generally found in Cabinets under the Title of native Antimony.

These are the Forms in which Antimony appears in those Ores in which it is most pure; but beside these there are others very frequently met with, in which this Semi-metal is mixed with Silver and with Iron; these give it a very different Appearance. In *England* we also have Antimony mixed with Lead in the same Ore, a thing scarce known in any other Part of the World; and some of our *Cornish* Antimony-Ore contains also a small Portion of Tin. The *German* Ores of Antimony are frequently found of a fine silvery White or of a fine gold-like Yellow: these Colours are owing to the Admixture of the white or yellow *Marcasites* with them, and though very splendid as to the Appearance, they are far from being the most valuable of Antimony-Ores for working.

Antimony-Ore is very frequently blended with Cryftalline or fparry Matter ; fometimes it is perfectly covered with a fine yellow Sulphur, and fometimes with a Mixture of thefe and other Subftances together.

Antimony-Ore is found in great Abundance in many Parts of the World. The *German* Mines abound with it. There is a great deal of it in *France* and *Italy*. In *Hungary*, particularly about *Preſburg*, there is a great deal of very rich Ore found. The firſt Antimony of *France* is that of *Poitou* ; and in *England*, where we have no ſmall Quantity, that of *Endellion* in *Cornwal* is the beſt ; but this muſt be well purified from the Lead the Ore alſo contains before it is fit for Uſe.

The *Hungarian* Antimony-Ore is much of it of the naturally ſtriated Kind ; this was called the male Antimony by the *Romans*. The broad-grain'd, or that formed of large and ſhining Granules, which the *Romans* called the Female, is frequent in *Saxony*. Some of the ſtriated *Hungarian* Antimony-Ores are variegated with yellowiſh or orange-coloured Spots. Theſe Pieces are frequently found in the gold Mines, and are ſuppoſed to contain the Sulphur of Gold. The Chemiſts call this Kind *Antimonium Solare*, and are very full of an Opinion, that vaſt Matters may be done with it in the great Work of the Tranſmutation of Metals.

The Antimony-Ore is never brought into the Shops, or at leaſt it never ought to be. What we ſee there has been all melted from its State of Ore, and is in Cakes of the Figure of the Veſſels it has been caſt in all throughout compoſed of the ſame Sort of Striæ or Filaments as the finer Ores, reſembling ſo many bright Needles, diſpoſed in *Faciæ* or Bundles throughout the Maſs.

It ſhould be choſen very bright, tender and friable, compoſed of long and broad Striæ of the paleſt Colour, and the moſt glittering that can be found ; and the Tops of the Cakes, which are of an irregular or ſpongy Texture and blacker Colour, ought to be thrown away. The Sulphur that Antimony contains is not ſeparated in that Fuſion which it paſſes in the reducing it from its Ore. We have the moſt evident Inſtances of it in the Calcination of it afterwards, in which Operation we are offended with a Smell wholly like that of common Brimſtone ; and if it be performed in a dark Place, we even ſee it burn away in thin blue Flames.

Antimony thrown into a Crucible with Nitre, deſlagrates in the very ſame Manner that common Sulphur does under the ſame Circumſtances ; and if crude Antimony be diſtilled with corroſive Sublimate, a Cinnabar is prepared, called Cinnabar of Antimony. This owes its Origin ſolely to the Mercury in the Sublimate united with the Sulphur in the Antimony. In fine, the Sulphur may be ſeparated from Antimony in its proper Form by boiling crude Antimony in common Water, after it has been run with a Mixture of Quicklime or Potaſh, and then adding Vinegar or ſome other Acid to the Solution made of the Sulphur of it by the Water and alkaline Salts ; for a plain Sulphur is precipitated from it in this Manner.

The Glaſs of Antimony only loſes its ſemi-metalline Form by the Sulphur's having been driven off from the Antimony in Calcination ; and if it be fuſed in the Fire, and any ſulphureous and inflammable Matter be added to it, it inſtantly becomes Antimony again. Nay this Sulphur abounds ſo much in the com-
mon

mon melted Antimony, that an Acid plainly of the Kind of that of common Sulphur or Vitriol, for they are the same, may be produced from it.

The proper Solvent of Antimony in its reguline State is *Aqua Regia*.

Antimony is more easily separated out of its Ores than almost any other of the metalline Substance. It needs no Flux-Powders, and the utmost Caution necessary, is to keep off in a great Measure the Communication with the external Air, and to keep the Fire moderate that Part of it does not burn away or go off in Vapour. The Method of separating it is no more than this. Bore three or four Holes in the Bottom of a Crucible, and filling it half full of broken Antimony-Ore, set it in another Crucible and cover it with a Tile; lute all the Junctures with some *Windsor* Loam or any common Lute, and set these Vessels thus joined on the Hearth. Place some Stones or Bricks round them at six Inches Distance every Way, and fill up the intermediate Space with Ashes up to the Rim of the lower Crucible; then put burning Charcoal about the upper Crucible and blow it till it be red hot; keep it so a Quarter of an Hour, and then let all cool. The melted Antimony will be found in a striated Mass in the lower Vessel.

Antimony has had various Names among the Writers of the several Ages, and the Chemists have added to these a Multitude of fantastical ones, expressive either plainly or metaphorically of its Qualities. We generally call it *Antimonium* or *Stibium*. The *Greeks* called it *Stimmi*, and sometimes *Alabastrum*. And in the Writings of *Hippocrates* in particular, it seems to stand under the Name of *Tetragonon*. *Pliny* calls it *Lapis Spumæ candidæ nitentisque non tamen translucentis*, and the *Arabians* *Antimad* or *Atemed*. The Chemists from its Power of destroying other Metals, call it *Lupus Vorax*, the voracious Wolf, and *Saturnus*, from the Name of the God who was said to eat his own Children. They have also called it *Plumbum Sapientum*, the Lead of the wise Men, from its performing the Office of Lead only more perfectly in the purifying of Gold, and some of them *Magnesia Saturnina*. They also call it *Lavacrum Solis*.

The Character they denote it by is this ♂, a Circle, denoting the Body to be Gold, to which a Cross is added, to shew it very corrosive at Top.

Antimony is not only given in Substance, but a great many Preparations of it are in common Use in Medicine; they are either emetic, cathartic, diaphoretic, or sudorific. Crude Antimony in Powder is found of great Benefit in dissolving Viscidities in the Fluids, it gives Relief in cutaneous Diseases, and as some very confidently assert in Convulsions and Epilepsies. Externally in Ointments it is much commended for drying up of Ulcers, and for curing the Itch and other Diseases of the Skin, and in Plaisters for resolving of Tumours. With the Ancients it was in frequent Use among the Cosmetics, being the most esteemed Substance for tinging the Eyebrows black. This Practice is even as old as the Old Testament, for we find *Jezebel* and other of the *Israelitish* Women censured for this Use of it: the *Greeks* gave it two new Names on this Account, calling it *Gyraicon* and *Platyophthalmion*, from its making the Eyebrows appear broader than they naturally were.

Dioscorides and the older *Greeks* seem to have been but imperfectly acquainted with its Virtues internally; they tell us that it was astringent and cooling, but that it was apt to obstruct the Passages. They used it frequently in Collyriums for the Eyes, when they meant to dry up redundant Humours,

and also in old Ulcers. They calcin'd it in order to prepare it for Use, and made it into Pastills with the Milk of a Woman's Breast; these were usually of a square Form, and hence the Name of *Tetragonon* seems to have been given it by *Hippocrates*. The *Greeks* do not seem to have known any thing of it in any other Intentions than these.

Its Virtues as a Purge became known in the twelfth Century, at which Time *Basil Valentine* publish'd his Book entitled *Currus Antimonii Triumphalis*, in which he extolls it as a Remedy for almost all Diseases. In the fifteenth Century *Paracelsus* brought it yet more into Use. It was even after this however a disputed Point a long Time among the Physicians, whether Antimony were a salutary or a poisonous Medicine. At present we are however very well satisfy'd of its salutary Effects, and know of two very different Qualities in it according to the different Form it is given in, a purging and a diaphoretic. All the Preparations of Antimony operate either by Stool or Vomit, or by insensible Perspiration or Sweat. There appears no Reason in the World for People's ever having been afraid of giving the crude Antimony internally, we daily see it taken in large Doses a Dram or more at a Time, and that for a long Continuance without any bad Symptom or even the least Nausea, unless by Accident the Acid of the Stomach should be strong enough to prove a Menstruum to it.

The Preparations of Antimony most in Use are, 1. The *Sulphur præcipitatum Antimonii*. 2. The *Crocus Antimonii*, call'd *Crocus Metallorum*. 3. The *Crocus Antimonii Lotus*. 4. The *Tartarum Emeticum*. 5. The *Calx Antimonii*, call'd *Antimonium Diaphoreticum*. 6. The *Causticum Antimoniale*. 7. The *Cinnabaris Antimonii*. 8. *Regulus Antimonii Martialis*. And, 9. *Tinctura Antimonii*.

SULPHUR PRÆCIPITATUM ANTIMONII,

Precipitated Sulphur of Antimony.

Take Antimony sixteen Ounces; crude Tartar twelve Ounces; Nitre six Ounces; powder these separately, then mix them well and throw them by small Quantities at a time into a Crucible heated red hot, and finally melt the Mixture with a very strong Fire. Pour it out into a conic Mould that the metallic Part or Regulus of the Antimony may fall to the Bottom.

Separate the Scorixæ that are at Top and dissolve them in Water, filter the Solution, and to the clear Liquor drop in Spirit of Sea Salt, and the Sulphur of the Antimony will be precipitated. This is to be freed from the Salts by repeated Washings, and then dry'd for Use.

The Regulus separated in this Process is of Use, tho' not in Medicine. It is what the Pewterers use with the Tin in the making their finest Pewter.

The Sulphur is a Diaphoretic, and is said to be a great Medicine in Scorbutic Cases.

CROCUS ANTIMONII vulgo CROCUS METALLORUM,

Crocus of Antimony commonly call'd Crocus Metallorum.

Take Antimony and crude Nitre of each equal Quantities, powder them separately, then mix them well together and throw the Mixture by degrees into a red hot Crucible, let it be melted thoroughly, then pour'd out and separated from the Scorixæ and kept for Use. The common Method among our Chemists is to use but about half the Quantity of Nitre that is here ordered, and only to set it on Fire in the Mortar the Powders were rub'd together in, by throwing a Piece of burning Charcoal; a little common Salt is also usually added, and by
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this means the whole Process is soon finish'd, as they give it no farther melting; but this is a very unfair Practice. This Crocus in its crude State is principally used by the Farriers for their Horses.

CROCUS ANTIMONII LOTUS,
Wash'd Crocus of Antimony.

Boil the Crocus of Antimony reduced to a very fine Powder in Water, and after pouring this away wash it with more hot Water till it comes off insipid.

Some Authors give us the Result of this Process as the *Crocus Metallorum*, and call the crude Mass prepar'd by the latter *Hepar Antimonii*, or Liver of Antimony. Of this is made the *Vinum Antimoniale*, call'd also *Vinum Emeticum*, and *Vinum Benedictum*.

VINUM ANTIMONIALE,
Antimonial Wine.

Take Crocus of Antimony wash'd one Ounce, white Wine a Pint and Half, infuse them together without Heat and filter off the Wine for Use. This is a powerful Emetick, the Dose is from one Ounce to two or three. It is also sometimes prescribed in Glsters, where stimulating things are necessary.

TARTARUM EMETICUM,
Emetic Tartar.

Take Crytals or Cream of Tartar and wash'd Crocus of Antimony, of each an equal Quantity; common Water three times the Weight of the whole, boil all together for half an Hour, then filter the Liquor and evaporate it to a Pellicle; set it by in a cool still Place and the Salt will shoot into Crytals, which are the Tartar Emetic. Some have order'd the making this by evaporating the Decoction to a Dryness, but the way by Crytallization is preferable.

This is a very good Emetic, and is greatly to be prefer'd to all the other antimonial ones. Its Dose is from two Grains to six or eight, the Dose of this is always a determinate thing, which is by no means the Case in regard to the antimonial Wine, which may be stronger or weaker in the same Quantity as the Wine has been more or less acid, or more or less in Condition to extract a Tincture from the Crocus.

CALX ANTIMONII vulgo ANTIMONIUM DIAPHORETICUM,
Calx of Antimony commonly call'd Diaphoretic Antimony.

Take crude Antimony three Ounces; Nitre nine Ounces, powder them separately and then mix them, throw the Mixture by degrees into a red hot Crucible, after it has been melted let it be taken out of the Crucible and wash'd in several Quantities of warm Water till all the adhering Foulnesses and the Salts are separated from it. The best Method of doing it is by pouring the melted Matter out of the Crucible into Water, and after several other Washings, when the Water is insipid, to pour it off thick and turbid with the Calx and keep what subsides out of it for Use. It is a very good Diaphoretic, but is usually given with us in under Doses. It may be given to a Scruple, half a Dram or more, in which Case it opens Obstructions and attenuates the Humours in a very remarkable manner.

CAUSTICUM ANTIMONIALE,
The Antimonial Caustic.

Take corrosive Sublimate two Pounds; crude Antimony one Pound; reduce them separately to Powder, then mix them together and put the whole into

to a Retort with a large Neck and a wide Mouth, fit to it a Receiver, and setting it in a Sand-heat distill till the Neck is fill'd with a thick Substance like Butter; unlute the Vessels and set this thick Matter in a Cellar, it will run into an oily Liquor which is to be kept for Use.

This is a very good Caustic, it eats away fungous Flesh, and stops the Progress of Mortifications.

CINNABARIS ANTIMONII,
Cinnabar of Antimony.

Take the Remains of the making the Butter of Antimony out of the Retort, put them into a glass Bolthead, coat it over with Loam and set it in an open Fire of Charcoal, there will sublime a solid Substance which is to be separated by breaking the Vessel and to be kept for Use.

It is a noble Medicine in all Diseases of the Head, in Convulsions, and Epilepsies, and in venereal Cases. Its Operation is by Sweat. Its Dose is from five or six Grains to fifteen.

TINCTURA ANTIMONII,
Tincture of Antimony.

Take Salt of Tartar a Pound; Antimony half a Pound; rectify'd Spirit of Wine a Quart; reduce the Antimony to Powder and mix it with the Salt by Fusion in a strong Fire; when it is cold powder it and pour on it the Spirit of Wine, digest them together three or four Days in a Sand-heat and then filter off the clear Tincture for Use. The Salt of Tartar in this Preparation yields a Tincture as well as the Antimony. It is diaphoretic and attenuant.

REGULUS ANTIMONII MARTIALIS,
Regulus of Antimony with Iron.

Heat gradually in a good Crucible a Pound of clear and bright iron Filings, when red hot add a Pound of crude Antimony in Powder, encrease the Fire that the Matter may flow thin, then by a little at a time throw in four Ounces of powder'd Nitre made warm, make the Fire so violent that the whole may run fluid like Water, keep it thus half a quarter of an Hour and then pour it into a conic Mould; separate the Scorix when cold and there will remain a stellated Regulus as bright as Silver. The chemical Writers attribute great Virtues to this Regulus, but it is at present kept rather as a Curiosity than as a thing of any Use.

Besides the Use of Antimony in Medicine, it is of great Service in many of the mechanic Arts. Added to Tin it makes a very fine kind of Pewter, giving it a silvery Colour and making it very sonorous. It also enters the Composition of Bellmetal, that for the making reflecting Speculums for Optical Experiments, and for casting the Types for Printing. In Chemistry it is also of very great Use as it serves to the Solution of the Metals, and the Extraction of the metallic Sulphurs.

The specific Gravity of Antimony is to that of Water as 6220 to 1000.

CHAPTER III.

COBALTUM,
Cobalt.

THIS is a semi-metallic Substance which agrees with the Ores of Zink in that it does not precipitate its reguline Matter to the Bottom of the Vessel
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in Fusion, but raises it by Sublimation, and in the same manner will let it be wholly carried off by the Action of the Fire if some proper Method be not taken to retain it.

Cobalt has been but very lately well understood in the World, tho' it seems to have been known by its external Figure a long Time, as the *Lapis Aërosus* of some of the old Authors seems pretty plainly to have been meant as a Name for it.

It is a very dense and compact mineral Substance, usually of a blackish or a dusky blueish grey Colour, though sometimes paler: It is often of the exact Colour of the finer Antimonial Ores, tho' it seldom has all their Brightness. It is very heavy and in the various Masses is sometimes of a granulated and sometimes of a striated Texture. It is usually smooth and even on the Surface, but when broken in the granulated Pieces it much resembles the Grain of cast Iron, and in the striated ones shews a Number of wav'd Lines running in a very regular manner sometimes thro' its whole Mass, sometimes only thro' a Part of it; the same Lumps of Ore having often four or five separate Courses of these Fibres which seem so many Fasciæ of a purer Ore immers'd among a coarser of the same Kind. In some other Pieces neither the Granules nor Striæ are at all visible, but it resembles by its even Structure and uniform Look a Piece of melted Lead, only with less brightness; and finally there are other Masses of it found of a yet evener Structure, at least in many Parts and of a deep Black; these are less heavy and less hard than the rest. All these various Appearances of Cobalt may be however reduced by a closer Observation, and the help of Glasses to assist the Eye in discovering their Structure, to the various Arrangements of one Kind of Particles. All Cobalt is composed of Granules, and these as they are larger or smaller discover themselves more or less easily in the Mass; in some they are so small and so closely press'd to one another, that they make what appears to the naked Eye one solid Mass; in this Case the Cobalt looks like Lead, in others they are still small but separated by a black earthy Matter; in this Case they make the black soft Cobalt before mentioned; in some Cases they are large and apparent to the Eye tho' very irregularly dispos'd; these Pieces of Cobalt are such as break with an Appearance of the Grain of Iron; and finally, in some they are as large and are arrang'd into long and narrow Series which run in undulated slender Lines like Filaments along the Mass; these are the most beautiful of all the Cobalts, and when the Striæ are of a fine silver Grey, as is not unfrequently the Case, they are more beautiful than even the Antimonial Ores.

These are the genuine Appearances of Cobalt when it is in its purer State, but it is liable to be mix'd in the Bowels of the Earth with Sulphur and other extraneous Bodies, and from them acquires a very different Form from what we have described as that natural to it: in this Case it has very little of a metalline Look, but is a fine florid red Substance, sometimes pure, sometimes debased by a Mixture of yellow, grey, or blackish with it; and is sometimes found in compact Masses, sometimes in more elegant ridg'd and striated ones dispos'd in some Pieces without any particular Order, but in others elegantly stellated.

We are yet to add to these the Appearance that Cobalt makes in some of the German Mines where it is mix'd with the Matter of the Pyrites and acquires from it a glossy copperish or silverish Hue, and has sometimes only Veins of this Matter in it, the rest remaining pure Cobalt: the last Ores are very like some of those of Bismuth, and are not unfrequently confounded with them.

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These are all the Forms under which this Mineral appears to us, and tho' very different in themselves, yet they are all readily discovered to belong to the same Class when put into the Fire by the intollerable stink of Garlick, that is of Arsenic which they exhale. The only Substances Nature seems to have confounded Cobalt with are the Bismuth Ores: there is indeed a very great Analogy between these, many of the Bismuth Ores having true Cobalt in their Composition, and many of the genuine Cobalts yielding Bismuth: they both have also the blue vitrifiable Earth in them of which our Smalt is made: even the fine red Cobalt call'd by the *German* Miners *Cupffer Nicol*, and the Flower of Cobalt yields some genuine Bismuth by a very easy Process.

Whoever examines the Cabinets of Collectors will find many Substances preserved under the Name of Cobalt, different from what we have here described, but we are to observe that they are different from Cobalt also: what we mean by that Name is a Mineral from which Arsenic may be sublim'd, and which afterwards leaves an Earth which turns white Glass to a deep Blue; every Thing that will do this has a Title to the Name of Cobalt, unless it contain so much Bismuth as to deserve the Name of an Ore of that Semi-metal; but those Substances which do not contain Arsenic, or this Earth have no Right to the Name because ignorant People have given it to them. The true Cobalt is found in *Saxony* and *Bohemia*, and in some Parts of *England*, though with us in no great Quantity.

Cobalt is not totally soluble in any Acid, Aqua Fortis will take up a great Part of it, and Aqua Regia from some Masses of it, yet more, and either of these Solutions properly made and evaporated to such a Degree as to leave them very strong of the Cobalt, serve as a very remarkable Kind of invisible Ink, with which Letters or Figures made on Paper remain undiscernible. yet on its being held to the Fire they shew themselves in a beautiful green Colour, which goes off as they cool, but will be restor'd at any time on being held to the Fire again. I have known a Piece of Paper with a Figure drawn on it with this Solution retain its Virtues for five Years.

It is supposed that the vitrifiable Earth which gives the blue Colour to Glass, and the Arsenic which sublimes in the roasting are all that Cobalt contains, beside accidental Impurities; but I have by tedious Processes produced at length a Regulus from it which is Black and of a semi-metalline Appearance, and which readily fuses with Iron and destroys its Power of answering to the Magnet. This points out an antimonial Nature in it, and there are some other Qualities in it which seem to declare it to partake of the Nature of Bismuth, but no Art has yet been able to reduce it either to Antimony or to Bismuth, or even to separate either of those Bodies from it. These are Disquisitions however too curious to be treated of more largely in a Work of this Nature.

Arsenic and the *Smalt Earth* are the two Things for which Cobalt is work'd at this Time, and they are prepared in the following manner.

A Furnace is prepared considerably large but low, with a flat Roof and with a Chimney terminating in a large and wide wooden Funnel form'd of several Joints, and reaching, tho' not in a strait Line but with several Bendings, to the length of a hundred Yards or more. The Cobalt is bruis'd and wash'd and then is put into this Furnace with a moderately strong Fire, the Flame of which is every where beat down upon it from the flat low Roof. The Cobalt takes Fire
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and burns with a blue Flame, and in the burning emits a great Quantity of Flowers which are collected in the wooden Funnel in form of Soot, and are thence swept into a Heap: the Remains of the Cobalt are also swept together for the Purpose of making Smalt.

After having given thus far the Process common to both, we shall give the separate Preparations under their several Heads.

ARSENICUM,
Arsenic.

This poisonous mineral Preparation is of three Kinds, distinguished by their Colours into White, Red and Yellow: they are all Preparations of the Flowers of Cobalt before described. The white Arsenic is prepar'd from the Flowers without any Addition; they only sublime them in iron Vessels in a moderately strong Fire, and the Flowers rise in form of a more compact and white Matter, sometimes more sometimes less hard, and in some Pieces striated a little with a faint tinge of Red, this is the white Arsenic of the Shops, and the little Differences we have observed in it are only owing to the Degree of Fire used in the making it. This white Arsenic is the Basis of the Red and the Yellow. The Yellow is made by subliming this, or the Flowers of Cobalt, adding first to every ten Pounds of them one Pound of crude Sulphur in Powder; the Mass sublim'd from this Mixture is of a bright Yellow, and is what we meet with under the name of *Arsenicum Flavum* in the Shops.

The red Arsenic is made by subliming together ten Pounds of the Flowers of Cobalt, one pound of Sulphur, and six Ounces of the Scorix of Copper. The Mass rais'd to the Top of the Vessel from this Mixture is not less beautiful than the yellow Arsenic: it is compact and of a glossy Surface and much resembles Cinnabar in Appearance, only that it is not striated. Both this and the Yellow are equally poisonous with the White.

It is a very unfortunate Error that People have fallen into of confounding the yellow Arsenic with Orpiment: The one of these is a safe and harmless native Mineral, the other a chemical Preparation and a most fatal Poison, yet if Orpiment be ask'd for at our Druggists, many of them will offer yellow Arsenic to Sale under its Name; nay, it is very lately that a Man in very considerable Business in this Way offered me a Wager, that there was not any other Orpiment than the yellow Arsenic, which he offered to Sale while I was present under that Name.

White Arsenic, which is the Kind Authors always mean when they use the term Arsenic simply, proves upon Analysis to be compos'd of an acrid and corrosive Salt, a metallic or reguline Substance, and a small Portion of Sulphur. The acrid Salt is easily discovered in it by its Taste and Qualities, and may be by a careful Management separated from it by Water. Its Sulphur is distinguished by the Smell it emits while burning, but so much of this has been dissipated in the roasting the Cobalt, that the Remainder is too small in Quantity to be collected separate. The metallic or reguline Matter is easily discovered on running it into a Regulus with Iron, or yet more plainly by distilling four Parts of Arsenic, one Part of Suet, and half so much hard Soap mix'd together in a Retort, in this Case the Arsenic will be rais'd to the Neck of the Retort in a plainly metallick Form, and in this State it somewhat resembles Antimony.

Arsenic is so volatile that if a Piece of it be put in an iron Ladle over the Fire it burns wholly away, leaving no Remainder; it grows soft before it begins to evaporate, and while it is going off it emits a thick white Smoak and an intol-
lerably nauseous Smell of Garlic. The purest crystalline or icy Arsenic, which looks clear as Water when fresh made, contracts a white Coat like an Enamel, only by being expos'd to the Air: and it is very singular that though Arsenic in its common Form is not inflammable, its reguline Matter when reduced to its pure and proper Form is so.

However volatile Arsenic is in its own Nature there is a way of making it fix'd in the Fire, a Mixture of Chalk in double Quantity with it renders it greatly fix'd, and some of the purer Clays have yet more of this Power upon it.

Stratify'd with Iron in this sort of Mixture with the fixing Earths, it bears a Fire capable of melting that Metal, and running with it into a Regulus, it renders it white and brittle and less affected by the Magnet. The Iron reduced to this State by Arsenic is very difficultly restored to its primitive Purity, it requires the Force of a very strong and continued Fire to do it.

Copper stratify'd with Arsenic in the same manner becomes white as Silver, and considerably brittle; the Arsenic is very difficultly separated from this too, and on this Principle the Mixture may be made of some Use; for if the white Metal thus procur'd be melted with Borax and Tartar two or three times, so much of the Arsenic is dissipated indeed as leaves the Metal very malleable, but it still retains a very beautiful silver Colour.

Silver stratify'd in the same manner with Arsenic loses all its Malleability, tho' it suffers scarce any Change of Colour. It would puzzle a good Metallurgist, who had not seen the thing before, to say what this debased Silver was. The Arsenic however adheres less firmly to this Metal than to the less perfect ones, and is easily burnt away in an open Fire without the help of any Fluxes; it thus emits a white Smoak and intol-
lerable Stench, and the Silver is afterwards found pure.

Even Gold is not able to withstand this Effect of Arsenic: if stratify'd in this manner it receives a considerable Quantity of it into the Pores, as is easily seen by the want of its due specific Gravity, and it becomes white and brittle, so as to have not the least Appearance of what it is; nay it is so far alter'd by it, that if it be suddenly thrown into a Crucible heated white hot in a great Fire, a Part of the Gold itself is carried away in Vapour with the Arsenic that is thus forcibly and instantaneously driven off: the Remainder of the Gold is found quite pure at the Bottom of the Crucible.

Tin suffers most of all by an Admixture of Arsenic, they blend immediately together, and in an Instant calcine to grey loose Ashes. On the contrary Lead mix'd with this rapacious Substance begins to smok as soon as it heats, and is in great Part evaporated with the Arsenic under this Form, the Remainder running very readily into Glass of Lead.

Arsenic from these Properties becomes of infinite Use in Metallurgy, it preys most readily on Iron, next to that on Copper, then on Tin, and after this on Lead and Silver.

Arsenic may be fix'd by subliming it with a fix'd alkaline Salt or with crude Mercury, in either Case the Sulphur is separated from the Arsenic, and it forms white fix'd Crystals, and may also be run into a Regulus with the Addition of

Iron; but then if the Fire be not well managed, and the Process performed in a few Moments, the Arsenic is in great Part lost.

Arsenic taken internally is the most fatal of all Poisons. It brings on Faintings, Convulsions, burning Heat in the Stomach, Cold Sweats, and finally Death in a very short time. In Bodies opened after dying of this Poison, the Stomach has been found eaten almost thro' in several Places, and the Guts eroded; and it is particular that a Mortification of the Parts of Generation is always one of the Symptoms of it. If the Patient survives the Shock, he generally dies soon after of a Hætic brought on by it.

The Remedies are Oil and fat Broth immediately swallowed and given in Glysters, and volatile Salts with Cordials by the Mouth: But we have had very few Instances of People who have been recovered after the taking it. It is used in many of the Manufactures. The Potters employ it to clear the Glazing of some of their Vessels, and the Glass-men to purify the Crystal-Glass and make it more transparent. The Painters in Enamel use it also sometimes as a Varnish over their Colours. The white Metal produced by melting Copper with Arsenic according to the Method above laid down was at one time in Use, and was called *Alchymy*, but we have grown afraid of it of late Years because of the Arsenic in its Composition. It is sometimes used in the compound Metals intended for Speculums for Telescopes; but the more masterly Workmen of our Time find the Way to do better without it. Some have been bold enough, not to say mad enough, to recommend Arsenic in small Doses in intermittent Fevers; but this is a horrid Practice, and ought to be punished with the utmost Severity. Arsenic is in whatever Dose a Poison; and those who venture to give it in such Doses as do not immediately kill, little imagine however, what fatal Effects it may produce after a Time. The only Preparation of it received any where in the Shops, is one intended only for external Use, under the Name of the arsenical Magnet.

MAGNES ARSENICALES, *The Arsenical Magnet.*

Take crude Antimony, common Sulphur, and white crystalline Arsenic, of each an equal Quantity; put them into a small Cucurbit, and set it in a Sand-Heat, till the whole melts into one uniform Mass; this is to be suffered to cool, and then breaking the Vessel it is to be kept for Use. It is a gentle Caustic, and succeeds very well in taking down fungous Flesh in Wounds.

The Antients knew nothing of our Arsenic, we have very improperly attributed the Name by which they called the common yellow Orpiment to this Substance; and it seems from hence to have arisen that some have ventured to think of giving our Arsenic in Medicine, because they gave theirs so.

These Arsenics are the Produce of the Flowers of Cobalt. Those of the *Caput Mortuum* are Smalt and Zaffer.

SMALTUM, *Smalt.*

The remaining Matter of the Cobalt, from which the Flowers have been sublimed as before described, is suffered to cool and then taken out of the Furnace. It is then reduced to a fine Powder, and calcined over again in the same Furnace, and this is repeated till there is not the least Particle of Flame or Smoke

seen to arise from any Part of it. The Cobalt thus perfectly freed from its arsenical and sulphureous Part is then ground to an impalpable Powder, and a Mixture is made of one hundred Pounds of this Powder, fifty Pounds of pure white Potash, and a hundred and fifty Pounds of fine white Sand. This is all ground together in a Mill, and then put into a proper Furnace, like those of our Glass-houses, where it runs into an elegant deep blue Glass. This is afterwards ground to Powder in Mills contrived for that Purpose, and makes what we call Smalt or Powder-blue, used by our Painters and Washer-women. It has no Use in Medicine.

Z A F F E R A,
Zaffer.

This has been by many confounded with Smalt, and supposed to be the same Thing only in Substance, and the other in Powder: others have erred yet farther about it, and supposed it a native mineral Substance, from their finding it in Form of a hard Stone. It is thus prepared: Take of the fine Powder of calcined Cobalt before described one hundred Pounds, of calcined Flints reduced to a like impalpable Powder two hundred and sixty Pounds; spread it on a Floor and wet it with a small Quantity of Water, so as to form it into a stiff Paste. Put this by in a Heap, and in a few Weeks time it will concrete into a Mass as hard as a Stone. This is Zaffer; it is used by the Potters, the Glass-men, and the Enamellers.

The People who prepare these Substances find the Residium of the Cobalt much finer at some Times than at others; nay they sometimes separate it into a finer and a coarser in the working; in this Case they always use the finer and better for Smalt, and the coarser for Zaffer.

This vitrifiable Earth, which is always contained in Cobalt, and is the most valuable Part of it, is also contained in all or most of the Ores of Bismuth. It has not been found in any other Substance.

It has been supposed indeed by some that Bismuth was at the Bottom the real Matter that gave this Colour; but it is evidently not so, since Bismuth, however prepared for the Colouring of Glasses, or artificial Gems, will not stain them to the fine Blue of this Earth, but to a Purple with a remarkable brownish Tinge in it, very different from all the Colours of the Gems; we are to add also that there are many Cobalts that contain no Bismuth at all; though it is a general Observation, that those which contain the most Bismuth make the finest Smalt.

If a Cobalt is suspected of not being worth working, or if an unknown Mineral is supposed, but not perfectly known to be a Cobalt, there is a very ready Way of trying it on both Occasions. Powder a Dram of it and mix it carefully with as much Borax; put the Mixture into a Crucible, and keep it in Fusion in a strong Fire four or five Minutes, it will communicate its blue Colour to the glassy Substance that results from the Fusion of this Salt, in proportion to the Quantity of the Earth it contains; and from the Depth of the Blue it may be judged what is the Value of the Cobalt considered as an Ore for Smalt.

Cobalt is found in great Abundance in *Hungary*, and not unfrequently contains Silver-Ore among it; for which Reason the Possessors of it in that Country are not ready to part with it. It is also found at *Goffelaer* in *Saxony*, and in the Mines of the Valley of *Joachim* in *Bohemia*. We have it also in some of our Mines

on *Mendip Hills* in *Somersetshire* and in *Cornwall*; but it is not produced in any great Plenty in either of those Places. It is a very strong Poison before Sublimation, and in some Places is so corrosive that when it falls into Water in Places, where the Miners are obliged to stand, it ulcerates their Legs and Feet.

Agricola and some other of the *Latin* Writers have called it *Cadmia Metallica*, by Way of distinguishing it from the *Cadmia Fornacum* or Tutty, and the *Cadmia Lapidosa* or *Saxatilis*, the stony *Cadmia* which is our Calamine. It seems by the Description of the *Lapis ærosus* of the Ancients, that some of them meant Cobalt by that Name; but others say Things of that Fossile which put it wholly out of the Semi-metallic Class; be that as it will, it is evident they knew nothing of its Properties.

C H A P T E R VI.

B I S M U T H U M,
Bismuth.

BISMUTH is a considerably heavy Semi-metal, and is of a much harder and firmer Texture than Antimony, being not easily pulverisable in a Mortar as that is, tho' not yielding to the Hammer, nor shewing any the least Token of Ductility. It is very little susceptible of Rust, and in itself is scarce sonorous, yet mixt with other Metals it adds to their sonorous Quality, at the same time that it renders them more brittle; these two Properties depending in a great Measure on the same Principles.

It is of a fine bright silvery Colour, and of an extremely remarkable Structure, being composed of small Fasciæ of Plates or Laminæ, disposed irregularly among one another. It gives evident Tokens on the Trial of a Sulphur contained in Abundance in it, and after the Action of an Acid it lets go a bituminous Matter. It requires but an extremely small Degree of Fire to fuse it, melting before almost any other metallic Substance, and it is not fixed in the Fire but evaporates with a very moderate Degree of it. It very readily amalgamates with Mercury, and has this peculiar Quality, that when mixed with other Metals in Amalgamation with that Body, though but in a very small Quantity, it makes them run thinner in the Amalgame, and occasions a great Part of them to be carried through Leather in straining together with the Mercury.

Bismuth causes the Metals that are difficult of Fusion to melt with a much smaller Degree of Fire than they otherwise would do. It very freely and readily mixes with any Metal, and according to the Proportion in which it enters the Composition, renders them more brittle, white, and approaching to the Nature of the Regulus's of the Semi-metals. But some Cautions are to be used in the making these Mixtures; for as the Bismuth easily burns away, if the Metals be difficult of Fusion and require a strong and intense Fire, they must be fused before the Bismuth is added, and the Vessel then covered, and the whole kept no longer in the Fire, than just while the Mixture is made.

Bismuth is very readily dissolved in Vinegar, and communicates a saccharine Taste to it: it may also be dissolved in the stronger Acids, as Spirit of Sea-Salt, Spirit of Nitre and Aqua Fortis: from these Solutions in the stronger Acids it is easily precipitated, and forms a fine white Powder called Magistery of Bismuth much used as a Cosmectic.

Bismuth is to be chosen heavy, of a silvery Whiteness, composed of large Flakes, and not too hard to break. Our Druggists used to sell a Kind of Bismuth or Tin-glass as they called it, very different from this; it was only a Regulus of common Tin, made with the Help of Tartar and Nitre, to which some also added Arsenic. But this, which was once so frequent among the Druggists that they could not be brought to believe that there was any such Thing as natural Bismuth, or Bismuth worked from a peculiar Ore, and itself a peculiar semi-metallic Substance, is now universally exploded, and we meet with nothing but the true natural Bismuth among them.

Bismuth is sometimes found native in its pure and proper Form, lodged like the native Silver in Stones of various Kinds, and often shewing itself in round Bubbles on their Surface: this however is not its common Appearance: It is usually met with in the State of Ore, its Particles being penetrated by and mixed with Arsenic and Sulphur, and usually blended with a peculiar vitriable Earth, the same with that which runs into the Blue Glass or Smalt from Cobalt.

This is so abundant in some of the Ores of this Semi-metal, that after having run the Bismuth from them, I have often prepared a Smalt from the Remainder, undistinguishable from the common Kind made from Cobalt, and that by the same Process and the same Admixtures of Flints and fixed Alkalies.

The native Bismuth approaches so nearly to that separated from its Ores by Fusion, in its internal Structure, that if it should not be known at first Sight, it will always be so on breaking it, the Fasciæ of Plates being disposed in the same irregular Situations, and exhibiting the same silvery Brightness.

In the State of Ore when purest and richest it approaches somewhat to pure Bismuth in Appearance, being of the Colour of the white arsenical Marcasites and very bright and glittering. It is sometimes found in Masses of itself, but more frequently it runs in Veins of a silvery Hue in sulphureous Minerals, and is sometimes composed of Granules, sometimes of evident Fasciæ of Plates which greatly resemble the wrought Bismuth, but that they are more brittle. It is not unfrequently found in this Form in Spots and little Masses lodged in Lumps of the common Marcasites; sometimes also it is met with blended with the very Substance of the Marcasite into one Mass, resembling a common brassy or silvery Mundic, and rejected by the Miners as such. It sometimes looks purplish in the Ores from an over Proportion of Arsenic; and sometimes very yellow, from an over Proportion of Sulphur.

Bismuth is very easily separated out of its Ore: in general there needs no more than to break it to Pieces and melt it in a common Fire, covering the Vessel. But the Method we have delivered of procuring Antimony from its Ore is so easy and so applicable to this, that no other will be used by any Body who has tried it. If the Ore out of which it is to be reduced be less fusible, or more loaded with extraneous Matters, it will only be necessary to add to it some of the common black Flux made of Tartar and Nitre, with a Mixture of common Salt; only in this Case the Ore must be beaten to fine Powder, the Vessels carefully luted, and the Fire continued no longer than is judged just enough to melt it, for otherwise a Part of it will be dissipated and lost.

Bismuth has been known by various Names; we have been used to call it Tin Glass, a very strange and absurd Name for it: and the *French* by a not much

much better, *Etain de Glace*. It stands under the Name of *Marcasita Argentea* in some of the medical Writers, and is called by *Agricola Plumbum Cinereum*. The Ore of it is found in Abundance in *Misnia* and *Bohemia*, as also in many Parts of *Saxony* and in *England*. The Foreigners always esteem it a Sign that there is Silver underneath, when they meet with Bismuth. The *Greeks* and *Arabians* seem to have been wholly ignorant of it; for though the Writers of the latter Country mention a Substance under the Name of *Marcasite*, they mean by it the same vitriolic and sulphureous Substance that we still call by that Name, which is nothing of the Nature of Bismuth.

It is not yet received into general Use in Medicine, though some have very strenuously recommended the Flowers of it as a Diaphoretick and Attenuant. There are only two Preparations of it regarded at all in the World. These are the Flowers, and the Magistery.

FLORES BISMUTHI,
Flowers of Bismuth.

Calcine a Quantity of Bismuth by melting it over a gentle Fire, and continually stirring it about till it fall into a grey Powder; then mix with it an equal Quantity of Sal Armoniac, and put the Mixture into a Bolthead. Coat it over with Loam or any other strong Lute, and set it on a Charcoal Fire. Continue the Fire till no more seems to rise from the Bottom. Then when the Vessel is cold break it, and separate the Flowers found in the upper Part of it for Use.

These Flowers are said to be a powerful Diaphoretic, but the Dread of the Remains of some arsenical Matter, with which the Bismuth Ore is known to abound, keeps People from venturing to try them at present.

MAGISTERIA BISMUTHI,
Magistery of Bismuth.

Beat an Ounce of Bismuth to a gross Powder, put it into a Matrafs, and pour on it three Ounces of good Spirit of Nitre: when the Bismuth is perfectly dissolved, pour the whole into a clean earthen Vessel, and add to it three Quarts of Water in which there has been dissolved before hand an Ounce of Sea-salt: a white Powder will fall to the Bottom, which must be washed in several more Waters, and then dried in the Shade for Use. It is a Cosmetic, and as such is mixed in Pomatums and Unguents to whiten the Skin. It is known among the Women by the Name of *Spanish White*. It is also used by the Hair-Merchants to whiten and give a Gloss to Hair. It is not used in Medicine.

Bismuth is used by some in the making of Pewter, and by most Artificers in their Solders, as it makes the other Metals run the more easily and the thinner; if mixed in the Metal of which the Types for printing are made, it greatly improves it, rendering it harder and less brittle.

CHAPTER V.

ZINCHUM,
Zink.

ZINK is a semi-metallic Substance, which more than all the others of that Class approaches to the Nature of the true Metals. It is very heavy,
and

and is less hard than Bismuth, and greatly less friable than either Antimony or that Mineral. It in some Measure approaches to Malleability, being ductile to a certain Degree, though that a very limited one, especially when made warm. It is very little susceptible of Rust, and though in itself it is not sonorous, yet in Mixture with other Metals, it renders them much more so than they were before. It melts with a very small Degree of Fire, and if urg'd by a Heat a little more intense, it flies wholly off in Fumes: Though if these Fumes are preserved, they are found to form a peculiar Sort of Flowers, not easily reducible into Zink again. Zink is of a blueish white Colour, very elegant, and much approaching to that of Silver; and though it wants somewhat of the Lustre of the Bismuth, yet it has that Loss amply made up to it, in its more metalline Appearance. If burnt away in an open Fire, it yields a Flame of a beautiful green Colour. It melts very readily with Lead and Tin, and renders both of them the less malleable, in proportion as it is mixed in a larger Proportion with them. It may also be mixed in Fusion with Copper and Iron; but when mixed with these or with any other of the Metals that do not melt easily, Caution must be used, that the Degree of Fire necessary to fuse them do not burn it away. For this Purpose the Metals should be made into thin Plates or Filings, and be heated red hot in the Crucible, before the Zink is added; and as soon as this is done, the Fire should be made very brisk immediately, and the Operation ended with all possible Expedition.

Zink mixed in this Manner with four Times its Weight of Copper makes a very beautiful yellow Metal, called by us *Bath Metal*, and Prince *Rupert's Metal*; which, if its Malleability equalled the Beauty of its Colour, would be a very valuable Composition. Zink has also this peculiar Quality, that when urged by a large Fire in Mixture with the other Metals, it does not go off alone, but carries up a great Part of them also in Form of Flowers. This is the Origin of Pampholyx, Tutty, and the *Cadmia Fornacum*, which are principally procured from the Furnaces, where Copper and Calamine, which is the Ore of Zink, and acts only as Zink on these Occasions, are melted together.

It is soluble in *Aqua Regia* and in other of the stronger Acids. It is to be chosen the heaviest and the brightest coloured that can be found, and such as will not extend under the Hammer; for the People who sell it sometimes have the Dishonesty to mix Lead among it; but this is discovered by the too great Degree of Malleability it gives to it.

The Ores of Zink have till very lately been but little known. The principal of them indeed has been well known for many Ages as a Fossile Substance of Use in Medicine, but tho' it was found to have the same Effect on Copper as Zink, and in the Fire if kept in close Vessels to sublime into the same Sort of Flowers; yet it did not occur of a long time to any Body to suspect that these two Substances belonged in any Manner to one another. The Ore we mean there is the common *Lapis Calaminaris*, or Calamine, which as it is known by a peculiar Appellation, and is famous for many Virtues independent of the Zink it contains, may deserve to be treated of here under its common Name.

LAPIS CALAMINARIS,
Calamine.

This is a considerably hard and heavy mineral Substance, appearing of a stony

stony Nature, but of a lax and cavernous Structure, and not unfrequently containing little Shoots of crystalline or sparry Matter in the Holes. It is found in loose Masses generally from the Size of a Walnut or smaller, to those of two or three Pound Weight, tho' there are some much larger than these. The Surfaces of these are generally rugged and uneven, and their Colour when most pure is a pale grey with a faint Admixture of brown, but very often it is found of a red or brick Colour, and not unfrequently yellowish. The Pieces of other Colours also calcine in a small Degree of Fire to a pale red, whence it is probable, that those Masses which are found naturally so, may have owed that Colour to subterraneous Heat. Pure Calamine, though very much of the Appearance of Spar, yet proves not to be such, but of a crystalline Basis; for it will not ferment with, or be dissolved by any Acid.

It is not always found pure, but frequently impregnated with Particles of Iron, and sometimes loaded with little round ferrugineous Bodies, called by Naturalists from their Shape, Iron Pisolithi. *Geoffroy*, from this frequent Mixture of Iron-Ore with the Calamine, has fallen into an erroneous Opinion that Calamine itself was an Ore of Iron. But this will by no means bear enquiring into, nor is its sometimes containing an Iron-Ore so pure, as in some Parts to answer to the Magnet, any Proof that the Substance in which this Ore has chanced to be lodged, is itself an Iron-Ore.

Calamine is found in *Germany*, *Saxony*, *Bohemia*, and *England*. On the *Mendip Hills* in *Somersetshire*, we have some of the finest in the World. The Moderns have appropriated to it an ancient Name, *Cadmia*; *Agricola* calling it *Cadmia fossilis*, and *Schroder* *Cadmia Lapidosa*; but this is a very unwarrantable Proceeding, since it does not appear that the Ancients knew any thing of Calamine, but expressed other very different Substances by this Name.

Dioscorides and *Galen* agree in making no mention of it, at least it is very certain they never mention it as a Medicine, nor confound it with their *Cadmia*. At present it is in very great Esteem externally, not only in Collyriums for the Eyes, but as a Desiccative for weeping Ulcers, and for preventing Excoriations in Children. It has indeed been made more famous than it deserves in one particular Instance, that of its Virtue against Burns: It is on this Account made the principal Ingredient in a Cerate, called from its pretended Inventor, *Turner's Cerate*, which has been published to the World in a pompous Manner, as a Remedy for Burns, with a List of Cures performed by it; but a Man who knows any Thing of the Subject, will find even by that Author's own Accounts, that the violent Pain that usually attended the first Days of the Application, was owing to the Powder contained in it, which however fine will wound and vellicate the excoriated Parts, and often bring on fatal Consequences. We judge thus much proper to say on a Subject of this Kind, to caution the ignorant Part of the World from tormenting themselves under these Accidents with a Dressing which the Surgeons have found great Occasion to discard.

The great Use of Calamine is the mixing with Copper for the making of Brasses, this Change it makes in Copper wholly in Virtue of the Zink it contains, which Zink when separated from it will do the same.

The common Method of doing this is only by stratifying Plates of Copper and Powder of Calamine in large Vessels, that will bear the Fire, and after-

wards melting the mixt Metal that results from this. But the more accurate Way is to do it by means of an Admixture of a little Charcoal Dust which is the true Flux Powder for Calamine, in this Manner: Take a Pound and half of powdered Calamine, and the same Quantity of Charcoal broke to coarse Dust: Grind them together in a Mortar, and when thoroughly mixed, moisten them into a stiff Paste with common Water; then take a Pound of Copper in thin Plates, fill a Vessel with this and the Mixture before mentioned *Stratum super Stratum*, making the lowest as well as the uppermost Stratum of the Paste. Set the Vessel in a Furnace and make a great Fire about it; keep the Crucible white hot till a blueish Flame arise out of it; when this appears make the Fire more moderate; and finally, let all cool. Take out the Crucible, and there will be found a very fine Brass in it, weighing from twenty to twenty two, or three and twenty Ounces, according to the Goodness of the Calamine.

Any other Ore of Zink will answer as well as Calamine on this Occasion, if added in a Quantity proportioned to its Richness in Zink.

The Reason why the World did not sooner find out from this and other Properties of Calamine that it was the Ore of Zink, is that in the common Way of working Ores for their Metals or Semi-metals, no Zink can possibly be procured from any Ore, since it is so volatile that the same Degree of Fire that is sufficient to disengage its Particles from their adventitious Mixtures, is also sufficient to drive them off in Vapour. But Methods have of late been found to work it to Advantage for this Mineral at *Bristol* and in some other Places. The Proprietors of these Works are in the right to keep their Methods secret, and we would not wish to divulge them: We shall only observe that any Body who will commit Calamine to the Fire stratify'd with Charcoal in Vessels out of which the Fumes cannot escape, will not fail to find Zink in some Part of them.

Calamine should be chosen for medicinal Use the heaviest, softest, and most friable that can be got, and such as is least debased by Mixtures of other Substances; and notwithstanding that it has become a Custom to use red Calamine, there is no doubt but the grey would answer all the Purposes better. We have in the *English* Shops, the finest Calamine in the World. The *French* in general have it very bad, they will not be at the Pains of importing it from us, or from *Germany*, but use that of their own Country, which is found in great Abundance about *Bourge* and *Saumur*, and is of the impure Kind we have already mentioned, containing Iron in great Abundance in it. It seems to have been owing to this Fault in the *French* Druggists, that so great an Author as *Geoffroy*, having no Opportunity of seeing the pure Calamine of *England* and other Countries, supposed it to be all like what they had in their Shops, and therefore concluded Calamine to be an Ore of Iron. This may serve as an exemplary Instance how necessary the punctual Descriptions we have given of the Bodies treated of in this Work are; since for want of them, People even so near as we and the *French*, mean two very different Substances under the same Name, and quarrel with each other for attributing Qualities, which though they agree very well to the Substance understood by that Name by the Person who mentions them, are foreign to those of the Substance the Reader understands by it.

Zink

Zink is never found native in its own Form: but beside the Calamine it has other Ores. There is a green crystalline Substance found in *Cornwal* which yields Zink, it is found in small Nodules of the Size of a Walnut, and debased with a ferrugineous Earth. There is also a dusky brownish Stone with some Appearance of Iron, which though common in the *Saxon* Mines, is not esteemed an Ore but rejected, from which I have obtained three Drams of Zink from the Ounce. The greatest Quantity of Zink however that has been produced in *Europe*, has been had from the Mines of *Gosselaer* in *Saxony*, where there is no peculiar or appropriated Ore for it; but it is separated from a Mixture of mineral Matter, in which there is Iron, Lead, and Copper, all in considerable Quantity. These are reduced to the State of Ore in this Mineral, principally by an Admixture of Arsenic; and among these there is also Zink in such Abundance, that a great Part of *Europe* was at one time supplied thence.

This Ore is not wrought for the Zink, but that Semi-metal comes in the Way by Accident, as they are separating the other Metals, especially the Lead from it. They roast the Ores a long Time to free them from their Arsenic and Sulphur, and then melt them by stratifying with Charcoal and by a strong Blast of Bellows; the Furnaces are close, but they have one Wall less thick and consequently less violently hot than the rest; to this the Zink applies itself: A green Flame that rises in Abundance from the Ore shews that there is Zink in it, and when the Lead, &c. are separated and have run off, the Zink is found in considerable Quantities applied to the Sides and Joints of this thinner Wall, though doubtless much more than is found there has been burnt away during so violent and long continued a Heat. They have a Way of saving more of the Zink than they otherwise would do by striking against the thin Wall to which it hangs, while it is in Fusion, and thus shaking it off into a Passage contrived on Purpose to carry it into a Receptacle, out of the Heat of the Fire; but the Quantity they save thus is inconsiderable, not more than a Pound or a Pound and half from sixteen Hundred Weight of the Ores. The Calamine which is the proper Ore of this Semi-Metal is also found in Plenty at *Gosselaer*, but they do not work it for Zink: There is not any of it distinguishable to the Eye in their Ores from which Zink is separated; but it is a Question whether it may not be blended in imperceptible Particles among them and be the true Basis of it there.

Beside what we know of *English* and *Gosselaer* Ores of Zink, we know that a great Quantity of it is annually imported from the *East-Indies*, though we are not informed in what Manner it is produced there; however as we know Calamine to be frequent there, it is probable enough that they have the Art of working it, so long sought after in vain in *Europe*. It is observable however that the *Eastern* Zink is bluer and more ductile than ours.

Zink is call'd by many Authors by the vague and indeterminate Name Marchasite, by which also they have call'd a great Number of other Substances. *Schroder* calls it *Marchasita Pallida*, and we frequently hear of it under the Name of *Spelter* and *Tutenag*. It seems to have been wholly unknown to the Ancients, and indeed its true Nature and Origin have been known but a very little Time among us. Zink is not used in Medicine in its natural State, the only Preparation we hear of for this Purpose is its Flowers.

FLORES ZINCHI,
Flowers of Zink.

Melt some Zink in an earthen Retort, fit to the Retort, by means of an Aludel, a large glass Receiver, make the Fire strong about the Retort, and as you will be able to see into it thro' the Receiver, you will see the melted Zink emit a copious white Fume and afterwards take Fire and burn with a greenish Flame; immediately after this a thick grey Smoak will arise from it which will fill the Receiver with Substances like Cobwebs. Let the Fire be kept up very strong for an Hour, and afterwards when the Vessels are cold open them and there will be found in the Receiver the Flowers of Zink sticking every where to its Sides in Form of a soft blueish white Powder. In the Aludel there will be found heavier and bluer Flowers, and some small Portions of the Zink sublim'd in small round Drops in its own Form.

If the Zink be melted in an open Vessel in a Furnace it takes Fire much more readily than it does in a close Vessel, and soon fills the whole Cavity of the Vessel with Flames in Form of Locks of Wooll, these soon cover the Surface of the melted Zink and prevent its forming any more of them; but if they are taken away from Time to Time, more and more of them will be form'd till the whole Substance of the Zink is sublim'd into them, and unless the Fire be very strong indeed little of the Zink is lost this Way.

It is remarkable that these Flowers are fix'd in the Degree of Fire in which they are raised, nay, a considerably greater Degree of it is not able to convert them into Zink, or to raise them again; they will run into Glass with common Flux Powders if violently urg'd, and the only way to recover any Zink from them is to mix them with the Salt procur'd by inspissating the capital Soap Lees made with Lime: This Mixture exposed to a strong Fire in a Crucible will yield a few Grains of Zink, but they are dispersed and cover'd over with thin yellow Crusts.

Homborg found away to extract a very subtle inflammable Oil from these Flowers. They are not much known in Medicine, but they are said to be sudorific, and that in over Doses they sometimes prove also both emetic and cathartic: they are prescribed from four Grains to twelve. Externally they are of the Nature of what we expect under the Names of *Pompholyx* and *Nihil griseum* in the Shops; and as we very well know that those Substances are not to be met with genuine, it would be very proper to introduce them into Practice in their Place. They are very drying and astringent. *Barbette* commends them greatly made into a Collyrium with Rose Water in Ophthalmies arising from an acrid and salt Humour. They are also good in old weeping Ulcers, and are recommended in fine Powder to be sprinkled on Excoriations.

O F T H E
SEMI-METALLIC RECREMENTS,
TUTTY, POMPHOLYX, and SPODIUM.
AND OF THE
CADMIA of the ANCIENTS.

AFTER the Consideration of the Metals and Semi-metals, the three Recrements so much celebrated by the old *Greek* Writers for their Virtues naturally claim their Place. They are very nearly ally'd to each other; and tho' separated from a Mixture of metalline and semi-metalline Matters in Fusion together, yet they partipicate so much of the Nature of the latter, that we have ventured to call them not metallic but semi-metallic Recrements.

CADMIA ANTIQUORUM,
The Cadmia of the Ancients.

The generality of Writers on these Subjects have suppos'd that our Tutty is the same with the factitious Cadmia of the Ancients, but erroneously; that was indeed a metallic Recrement, being produced only from Copper: ours is on the contrary produced from a Mixture of Copper and Calamine, and is evidently owing principally to the latter Substance.

The Ancients indeed express'd so many different Things by the Word Cadmia, that it is not to be regretted that it is now almost diffus'd in the Shops.

Dioscorides describes a Recrement of Copper under that Name, and does not indeed seem to have meant any thing else by it: but *Galen*, who in some Parts of his Works plainly means also this Recrement, in others tells us that there was another Cadmia which was a native Mineral, and was found in the Island of *Cyprus*: and *Pliny* in the same manner mentions a native Cadmia, which he calls *Ærofa*, from its containing Copper which was melted from it in some Places: *Galen* indeed calls his native Cadmia only *Lapidosa*, and does not tell us of its absolutely containing Copper, yet it is probable enough that these two Authors mean the same Substance, and that this Substance was no other than a poor and stony Copper-Ore.

The Moderns have not a little added to this Perplexity by calling another Substance *Cadmia Lapidosa*, namely the *Lapis Calaminaris*, which contains no Copper, and therefore cannot be the *Cadmia Nativa* of the Ancients, supposing that of *Galen* and *Pliny* to have been the same; and as if there was not yet Confusion enough under this unintelligible Word, they have also included the Cobalt under it, with the Addition of *Metallica*.

When the present set of Writers, whom we are sorry we cannot praise for any over Accuracy in regard to Minerals, use the Word Cadmia, or even add to it
their

their favourite epithet *Fossilis*, what are we to understand that they mean? Are not the Cobalt, Calamine, and native Cadmia of the Ancients all equally entitled to the Name of *Cadmia Fossilis*, and yet are they not three as different Substances as the Mineral Kingdom produces?

We are to rank the *Cadmia Nativa* of the Ancients then only among the Copper-Ores, and indeed their Descriptions of it are so short and inaccurate that there are many of the Ores known at this time to any one of which they equally agree. This however is not the Cadmia whose Virtues they were so fond of in Medicine: That was the *Cadmia Faëtitia*, or Cadmia produced in the Copper-Works.

The *Cadmia Faëtitia* of the Ancients then was a Recrement of Copper produced in the Furnaces where that Metal was separated from its Ore, and there was driven by the Blast of the Bellows against the Sides and Roof of the Furnaces, or collected in their Chimneys. Of this Cadmia they distinguished several Kinds, according to their different Degrees of Fineness, and the Forms in which they concreted: These were different both in Texture and Colour, according to the Parts of the Furnace to which they adhered, the lightest and finest rising always to the higher Places.

The finest of all was found in the very Mouths of the Furnaces, from whence it issued out with the Flame and Smoak, and was therefore call'd *Capnitis*, or Smoaky Cadmia, a great Part of this was necessarily lost in the Air, but the little that adher'd to the Mouths of the Furnace was collected in Form of Powder or of fine Ashes. The finest Cadmia next to this was that found on the Roofs of the Furnaces, this generally hung down in Form of Clusters of round Bubbles, and was therefore call'd the *Cadmia Botrytis*, the botryoide or clustered Cadmia; this was much more firm and heavy than the *Capnitis* before mentioned, but it was much lighter and more friable than any of the others. This was sometimes grey and sometimes purplish, and that of the latter Colour was always esteemed the best.

A third Kind of their Cadmia was that which gathered about the Sides of the Furnaces as not light and fine enough to ascend to the Roof; this was call'd *Cadmia Placitis*, or the Crustlike Cadmia, as it was always separated from the Walls in Form of Crusts. The former of these was used for Diseases of the Eyes, this was known to be coarser and was reserved for the dressing of Ulcers. Of this crustated Cadmia however they distinguished two Kinds, the one of a blueish Colour on the Outside and variegated with Spots within, this they call'd *Onychitis* from some Resemblance to the *Onyx* in its Veins and Clouds; and the other which was quite Black throughout they call'd *Ostracitis*, this was esteem'd less proper than any of the others for Distemperatures of the Eyes, but was particularly valu'd for Ulcers.

Dioscorides tells us that these were the Kinds of Cadmia in Use and Esteem in his Time, and that besides these there was a light white Kind produced in the Furnaces where Silver was melted, but that it was of less Value; and *Galen* adds, that there was also a Kind made from the Pyrites.

All these Kinds of Cadmia are out of Use, and consequently are unknown in the Shops at this Time, having been found inferior in Virtue to the modern Tutty, which is a Recrement produced in the same manner, but in the Production of which the Ore of Zink has a great Share. The *Arabians*, who lived much nearer the Times of the *Greeks* than we do, were wholly unacquainted with

with these Kinds of Cadmia in Use among them, and even apply'd what they have left recorded of them to other Substances. *Avicenna*, who seems to comprehend all the metallic Recrements of whatever Kind under the Name *Chinia*, confounds the Cadmia of *Dioscorides* with what he calls *Chinia Auri*, that is, Litharge of Gold, and even applys the Words in which *Dioscorides* had described them, to the Description he gives of the Litharge of Silver.

The Ancients in general have related Wonders of the Virtues of their several Kinds of *Cadmia Faëtitia*, as Absorbents and Desiccatives. They tell us that in Diseases of the Eyes Collyriums prepar'd with them scarce ever fail'd of curing, and if one could believe what they add of their Virtues in Wounds and Ulcers, we should be apt to think that many of the terrible Operations of their Chirurgery might have been spared.

TUTIA,
Tutty.

The Tutty which we use in the Shops at this Time owes its Origin truly and properly to Zink. It is a Recrement of mix'd Metals in which *Lapis Calaminaris*, which is the Ore of Zink, or in which Zink in its metallic Form is an Ingredient; and is collected in the Furnaces where Brass is made from Copper and Calamine, and where the other mix'd Metals are run.

In these Furnaces they place under the Roof and about the upper Parts of the Sides, Rods of Iron, and sometimes Rolls of a dry Earth, about which the Tutty is afterwards found.

We have observed in treating of Zink that this Semi-metal sublimes with a very small Fire into a Kind of Flowers, and that when fused with any other Metal it flies from it in Abundance under this Form, and also frequently takes some Part of that Metal more or less up with it. To this Property of Zink is owing our Tutty, which is properly no other than a Kind of Flowers of Zink impregnated with Copper, &c. and which is the more certain from this, that absolute Zink may be procur'd by Fusion from Tutty, and that in such considerable Quantity as proves it to be the Basis of the Substance. The Tutty of different Kinds yields Zink in different Quantities in Proportion to its Purity, but I have met with many Pieces from which I have been able to reduce between three and four Drams of pure Zink from the Ounce.

It is sufficiently evident from this that the Tutty or Cadmia of the Ancients must have been wholly different from ours, as they used no Zink nor any of its Ores in the Furnaces where they collected it; and we see how very sorry a Notion of these Matters also *Garcias* had, who took Tutty to be prepared from the Ashes of a Tree, or *Bontius*, who suppos'd it to be a peculiar glutinous Earth, and from whom our *Douglas* borrow'd his Opinion of its being a Kind of Indian Clay dry'd in Furnaces.

Our Tutty is a hard and heavy semi-metallic Recrement, sometimes met with in the Shops in thin flat Pieces, or Flakes, but most abundantly in tubular cylindric Pieces, resembling Segments of the Barks of Trees, push'd off from the Branches without breaking: these are of different Lengths and Diameters, and are often broken whole, often broken into Halves or Fragments of a smaller Sort. They are smooth and even on the inner Surface, or that which has been next the Rods or Rolls placed in the Furnace, but on the outer Surface they are full of small Granules and Protuberances, that seem to resemble in Miniature the botryoides

Appearances

Appearances describ'd in the ancient Cadmia. The finest is that which is of a fine deep Brown on the Outside and of a yellowish Tinge within; the thickest, brightest and most granulated, the hardest to break, and that which has least Foulness among it.

We are very fond of keeping up the old Epithets of medical Substances, however much Reason there may be for dropping them, and we therefore at this Time express the best Tutty by the Name of *Tutty of Alexandria*. There was doubtless a Time when Tutty was brought thence, and probably from the Preference expressed by the Name it was very good too, but at present we do not send so far for it: all that we use is brought us from *Germany, Sweden*, and the other Parts of *Europe*, where Brass or Bellmetal are run in Quantities. It is plain enough that the *Greeks* were not acquainted with it, but some of the *Arabians*, however much they blunder'd about the Cadmia of those Days, seem to have taken up a tolerably right Opinion of our Tutty, and to have call'd it by the same Name; for *Serapio* tells us, that there was one Kind of Tutty in Use among them which was collected in those Furnaces in which Copper was made yellow. We are not however always to suppose they mean this Substance by the Word *Tutbia*. There are Passages in their Works which seem plainly to prove that they meant no other than calcin'd *Lapis Calaminaris* by this Name. Had the Writers of earlier Times been at the Pains of leaving us Descriptions of the Bodies they used, these Uncertainties had been all avoided, and we had reap'd vastly more Benefit from their Practice as recorded to us.

Tutty stands foremost in the Rank of ophthalmic Remedies: It is abstergent and desiccative, but without any Erosion, whence it is of very happy Use in Ulcerations of the Parts about the Eye, either in Form of Unguent or a Collyrium: in the latter Form made up only with Rose Water it is of excellent Use in Itchings of the Eyelids, which are apt to provoke rubbing, in inveterate Ophthalmies, and in Defluxions of Humours on those Parts. It is to be prepared for Use by heating it several Times red hot and quenching it suddenly in Rose or common Water, then powdering it in a Mortar and finally levigating it with a little Water upon a smooth hard Marble till there does not remain the least gritty Particle amongst it: It is then to be drop'd upon a Chalk Stone and left to dry. Very particular Care is required in the levigating this Substance, as it is intended to be used about so tender a Part as the Eye; for if there be any coarse Particles among it 'tis easy to see that it must create more Evils than it was intended to prevent.

Fine Powder of Tutty mix'd with four times its Weight of Pomatum, or of Butter without any Salt in it, makes an excellent Liniment to be apply'd to the Eyelids in Case of Redness, Itching, and a beginning Inflammation.

POMPHOLYX.

Pompholyx is a semi-metallic Recrement, very nearly ally'd in its Nature to Tutty, and is yet more evidently and more properly even than that the Flowers of Zink, as notwithstanding that it is in the same manner with Tutty sublim'd from the Ores of Zink fus'd with other Metals; yet it is more properly of the Form and Figure of the simple Flowers of Zink or Calamine, is sublimed higher than the Tutty and carries yet less of any other metalline Parts with it. It is a white, light and very friable Substance, found in thin Cakes or Crusts adhering to the Domes of the Furnaces, and to the Covers of the large Crucibles

in which Brass is made either from a Mixture of Copper and *Lapis Calaminaris*, or of Copper and Zink, which is the Semi-metal produced from that Ore. It is found also concreted in form of a whitish Powder on the iron Rods with which the Workmen stir the Metal while melting, and on the Tongs with which they take the Crucibles out of the Fire ; in short Pompholyx being raised incessantly during the first Fusion of Brass is found upon every thing that comes near the Vessels in which it is fused.

The *Dutch* are careful enough to save all these Flowers, and have from this Caution been able to supply all *Europe* with a Drug which every Nation might if it pleased have had at Home ; but as at present our People have got into a way of Thinking that Tutty and Pompholyx are the same Thing, and consequently of using Tutty under the Name of both they have no occasion for the other ; but this is wrong however, for the Pompholyx is a much lighter and finer Substance and much less impregnated with Copper than the other.

Pompholyx is collected also in the Domes of the Furnaces in which Cannon and Bellmetal are cast : in these it is never so white, and is usually harder than the true Kind, but even this may be rendered white, as all the Flowers of Zink may by burning. The Writers have call'd it, beside Pompholyx, by the several other Names of *Nil*, or *Nibil*, and *Nibili Alleum*, *Capnitis*, *Bulla Cadmica*, and *Calamites*, and in *English* Brown Ashes, or White Calamy. It is easy to see that the *Capnitis* and *Bulla Cadmica* are Imitations of the Names of the Cadmia among the *Greeks*, but they are improperly apply'd to this Substance, because all the Cadmiæ of the *Greeks* were Recrements of Copper alone, not of Copper and Calamine as ours, in which the Calamine is almost the only thing that sublimes : Those Authors indeed mention a metallic Recrement under the Name of Pompholyx, but it differs from ours in the same manner as their Cadmia does from our Tutty. Theirs was a Recrement of Copper alone, and they tell us it was found after two Manners, either from the lightest Part of the sublim'd Matter of the Copper in their Furnaces rising to the highest Part of the Dome and there adhering in form of a white Powder, or from their Cadmia, that is the former Recrements of Copper calcin'd in a large Fire and blown against the Sides of the Furnace by violent Blasts of Bellows. *Dioscorides* tells us of two Kinds of Pompholyx in Use in his Time, the one flattish and of a coppery Colour, the other extremely white and very light : these were probably the two Kinds we have already mentioned, one naturally produced in the Fusion of Copper, the other forced by Blasts of Bellows. Though he seems to give a Recalcination of the formerly made Cadmia as the Preparation of even the fine white Kind, which he tells us owed its Origin principally to those Meltings of Copper in which the Workmen added a great Quantity of powder'd Cadmia to the Metal in Fusion.

The Pompholyx as well as the Cadmia of the Ancients might be had at this Time if we chose to search the Furnaces of the Copper Works for them, but our own are so much better from the Zink they contain, that it would be idle to give ourselves any Trouble about the others. The Truth is that the Flowers of Zink or of Calamine, for they are the same, whether raised from the reguline Substance or from the Ore, are better than all the others in all the Intentions in which they are used in Medicine ; and the others are better or worse as they approach more or less to the Nature of them. The Pompholyx therefore as it

approaches nearer to the Nature of pure Flowers of Zink, or as it carries less of the Copper in it, has all the desiccative and abstergent Virtues of the Tutty, but has yet less Acrimony than that: it obtunds the Sharpness of the Humors in any Part, and is thence, though erroneously, said to be cooling: it is much easier reduced to Powder than Tutty, and is less apt to contain hard Particles: it is not only a better Medicine in Collyriums and Unguents for the Eyes, but it is excellent in the cleansing and drying old Ulcers; and *Lemery* tells us that some People have ventur'd to give it internally in pretty large Doses, such as a Scruple or two in intermitting Fevers, and that its Operation is by Vomit.

We have already however so many more promising Medicines for these Cases that it does not seem adviseable to search for such as these to add to the Number.

SPODIUM.

Spodium was one of the foulest and coarsest of the metallic Recrements of the *Greeks*, and tho' a Substance as much answering to their Spodium, as our Tutty does to their Cadmia, might be easily collected in our Furnaces, we do not at present give it a Place in the Shops as we have so many others of the same Kind, but preferable.

When the ancient Metallurgists melted Copper in their Furnaces, and particularly when they added in the subsequent Fusions, by which they meant to refine it more and more, the Recrements or Cadmia of the several Kinds scraped from the Roofs and Sides of the Furnaces, and beat to a fine Powder; this recrementitious Matter was then again sublim'd from the Mass, and a Part of it adher'd in Form of fine light white Crufts to the Roof and Sides of the Furnace; this they collected separately under the Name of white Pompholyx. The far greater Part of this Matter however, though separated from the melted Metal, was thrown up in such coarse Pieces by the Blast of the Bellows that it did not adhere to the Roof, but struck against it and fell down into the several Parts of the Furnace; this was what they call'd Spodium: they collected it in Form of a blackish heavy Matter, and generally mixed many Kinds of Foulnesses among it: it was indeed no better than the Sweepings of the Furnaces.

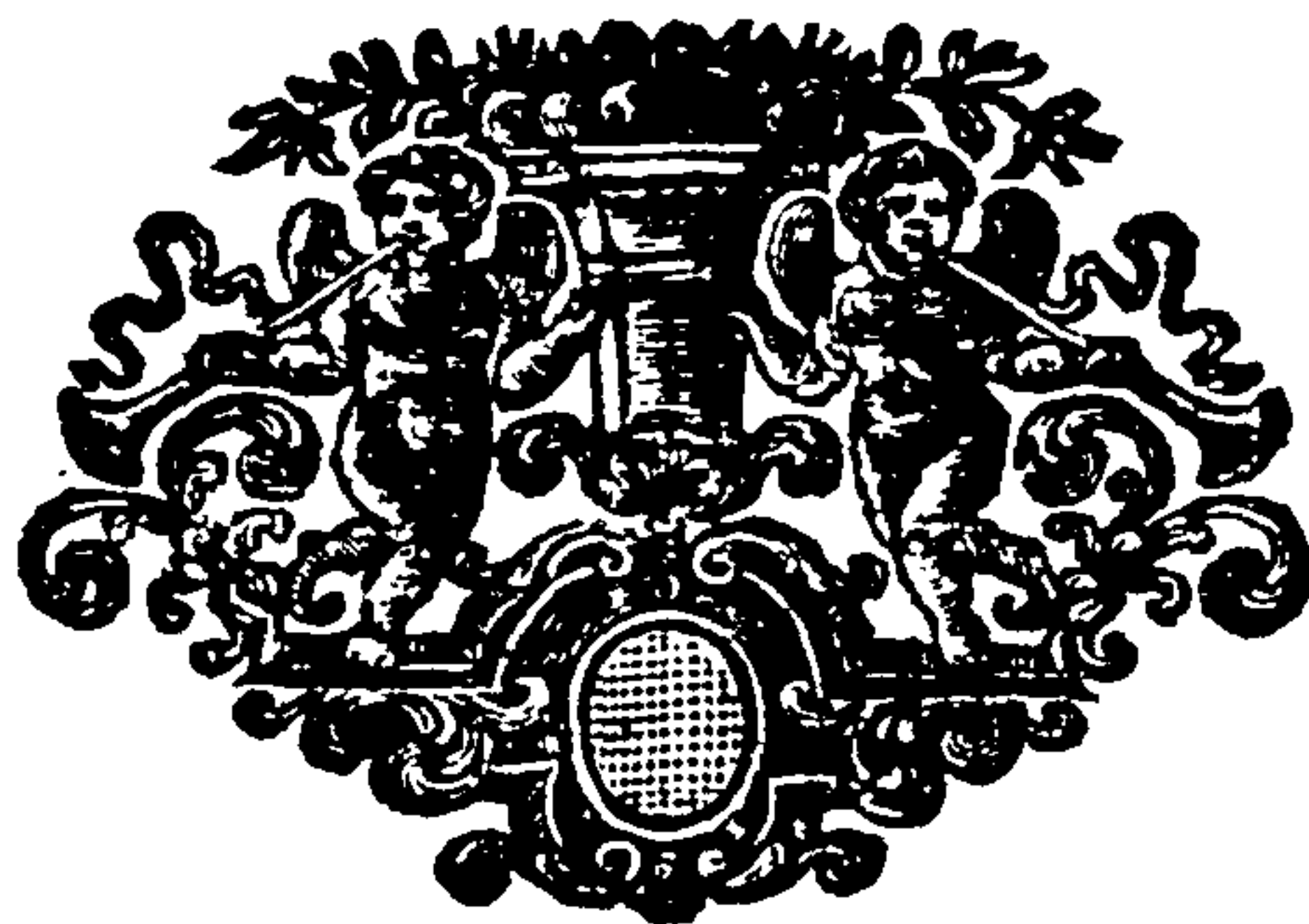
The *Greeks* always esteemed this much inferior to the Cadmia and Pompholyx: they esteemed it poisonous given inwardly, and therefore confined it to external Application, and even in that Sense would seldom admit it into the Compositions intended for Distemperatures of the Eyes, but used it principally for the detarging and cleansing of old Ulcers.

When we have given this Account of what was the true Spodium of the ancient *Greeks*, it remains to observe that the Word was also used afterwards to signify many other Things. *Pliny* tells us that in his Time the Term was not limited to the Recrements of Copper, but that beside the *Spodium Aerarium*, which was what we have described, there was a *Spodium Argentarium* prepared in the Silver Furnaces and called *Laurosis* from the Mountain *Laurius* in *Attica*, in which there were Silver Mines; and also another Kind found in the Gold Furnaces, and finally another in those of Lead.

It is very evident that these several Substances, tho' from the manner of their Productions they were call'd by the same Name, must have been very different in their Nature and Quality; but this is not the most extensive Liberty that has been taken with the Word: The *Arabians*, as the Term Spodium signify'd
only

only a calcined or burnt Matter, apply'd it to the Ashes of animal and vegetable Substances, and these by way of Distinction from the genuine and proper Spodium, they call'd *Antispoda*. Nay we even find among the *Greeks* these sort of Substances mentioned under this Name *Antispoda*. *Dioscorides* tells us of several, one made by burning the unripe Berries with the Flowers and Leaves of the Myrtle, the Ashes of these were washed in several Waters to free them from the lixivial Salt form'd in the burning, and were then kept as an Astringent: other of the *Antispoda* were made of the calcined Leaves of the Oleaster, of Glew, of Wool mix'd with Honey and Pitch, and of several other the like Mixtures.

The *Arabians* mention also a Substance under the Name of *Tabaxir*, which *Avicenna* tells us was the Ashes of the Roots of the Sugar Cane: The Interpreters of these Authors have rendered this *Tabaxir* by the Word Spodium, but it seems probable that what was meant by this Name was only an impure Kind of Sugar, which they being informed was produced from Reeds, took to be the Ashes of Reeds or Canes. Burnt Iron is now the common Spodium of the Shops.



F O S S I L E B O D I E S

Used in M E D I C I N E.

C L A S S the T H I R D.

S I M P L E S A L T S.

TH E simple native Salts are a Class of Bodies not very numerous but of great Importance in Medicine. All that are known of them in the World come under our Consideration as Subjects of the *Materia Medica*, and have beside, their Uses, and those not trivial or insignificant ones, in the Arts and Manufactures, and in what more immediately appertain to our Subject in Chemistry and Metallurgy.

By the term simple native Salts we understand Bodies found in their perfect and natural State, either within the Earth or on its Surface; sometimes in a solid Form, sometimes in a State of Solution in Water, but always reducible by Evaporation to their determinate Figure; Acrid to the Taste, friable, pellucid, not inflammable, but capable of Fusion in the Fire; soluble in Water, and naturally concreting again into regularly figur'd Crystals on its Evaporation.

Some of these Bodies are met with in the Earth perfectly pure and free from other adventitious Matters, but none of them in their proper Form: to reduce them to this there always requires Solution and a proper Degree of Evaporation of the Solvent; others of them are variously mixed and blended with Earths, Stones, and many extraneous Substances, among which the Eye cannot distinguish them, but even in this Case they are always discovered immediately by the Tongue. Salts in this State are much in the Condition of the Particles of Metals in their Ores, only that they do not so much as those Bodies alter the Substances they are lodg'd among: Finally, some other of the native Salts are only exhibited in that State in Solution, always occurring to us dissolved in Water, in which they manifest themselves indeed to the Taste and by their other Qualities, but from which it requires Art to procure them in their solid Form. We have some Salts which indifferently offer themselves to our Observations, in two or in all three of these Forms, and we have others which occur only in some one of them. Of the first Kind is the common culinary Salt which we meet with in a solid Form and pure in the Bowels of the Earth in the State of Sal Gemm, mix'd in small Quantities in some of the Earths and Stones, and in a State of natural Solution in the Waters of the Sea and of Salt Springs; of the latter Kind we have Instances in the natural Salt of the medicinal

medicinal Waters; and in Borax, neither of which are ever found native and in their solid Form.

The Bodies of this Class are seven in Number.

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|--------------------------------------|-----------|-----------------------------------|
| 1. NITRE. | 3. ALUM. | 5. The SALT of medicinal SPRINGS. |
| 2. Common SALT. | 4. BORAX. | 6. The NATRUM of the ANCIENTS. |
| 7. The SAL AMMONIAC of the ANCIENTS. | | |

After this, to avoid the Confusion of two Chapters in different Parts of the Work under the same Title, the Sal Armoniac of our Times, though not a Body of this Class, is treated of.

CHAPTER I.

NITRUM,
Nitre.

THE Salt which we know at this Time under the Name of Nitre or Salt-Petre, is a crystalline, pellucid, but somewhat whitish Substance, in its most perfect Pieces in Form of long and slender Crystals of a prismatic Figure of an equal Thickness throughout their whole Length, composed of six Planes or Sides, and terminated at the End by a Pyramid, small and short in Proportion to the size of the Column, but compos'd of the same Number of Planes: These Shoots vastly resemble the common Sprig Crystals of the Rocks. It is of an acrid and bitterish Taste, and impresses a peculiar Sense of Coldness upon the Tongue.

Nitre requires a little more than six times its own Weight of Water to dissolve it: It is fusible by a very gentle Heat, but is considerably fix'd in the Fire and evaporates its Water slowly and difficultly. It is not inflammable: if melted by the solar Rays before a Burning-Glass, or over the common Fire in a Vessel into which the Coals or other sulphureous Matter cannot fall, it never flames or burns; if urg'd by the Violence of the Heat evaporates in Fume, and makes its Way through the Sides of the Vessel; but if any inflammable Body be added to it, it burns with great Noise and Violence, and in fine with the Matter added changes in part into a fix'd Alkali.

It is singular that this Salt, though it affords by means of Fire an acid Spirit capable of dissolving almost any thing, yet manifests no Sign of its containing any Acid at all in its crude State. A Solution of Nitre makes no Change in the Colour of Syrup of Violets, nor even coagulates Milk, yet it inspissates the Serum of the Blood into a Kind of Jelly. Added to a Solution of corrosive Sublimate it after an Hour's standing makes it milky, and mixt with a Decoction of Galls it has the Effect of an Alkaline Salt, rendering it whitish or greyish and turbid.

Nitre is to be chosen in fair, long and transparent Crystals, and such as apply'd to the Tongue affect it in the manner of Ice, with a peculiar Acrimony, such as when set over the Fire fuses easily and readily, for pure Nitre melts the most easily of all Salts; and such as when thrown on the Fire blazes very furiously and emits a bright and vivid, not a languid Flame, and leaves only a very little fix'd Salt upon the Coals: that which makes a crackling when thrown on the Fire is to be rejected, it contains a large Quantity of Sea-Salt.

This Nitre is of the Number of those Salts which are naturally blended in
Imperceptible

imperceptible Particles in Earths, Stones, and other fossil Substances, in the same Manner as the Particles of the Metals are in their Ores. It is not naturally or usually discoverable in the Bodies that contain it by the Eye, but manifests itself in them to the Taste, and particularly by that Sense of Coldness which no Salt but Nitre impresses on the Tongue. Though this be its natural State, it is sometimes however found separate and pure in Form of an Efflorescence, either on its Ores, or on the Surface of old Walls; these Efflorescences dissolved in Water, shooting into regular and proper Crystals of Nitre. Nitre has been supposed by many, and those very eminent Authors, to be in part at least, if not wholly, a Salt of animal, not of fossil Origin, as they suppose that where it is found in the Earth, it owes its Origin to the Excrements of Animals, and where on old Walls to the Effluvia of animal Bodies once inhabiting them: but not to urge the Improbability of an animal Salt being lodged in stone Walls for many Ages after any Animals were among them, and affording a Supply of Efflorescences continually in the Place of those which are swept off, we may observe that our ranging it among the Fossils is sufficiently supported by our receiving the far greatest Quantities of it among us from the *Oriental* Nations, where it is found embodied in Earth as Metals in their Ores, and from whence it is separated by Water, as those other Bodies are from their Ores by Fire.

The Earth from which Nitre is made both in *Persia* and the *East-Indies* is a Kind of yellowish Marl: it is found in the bare Cliffs of the Sides of Hills exposed to the Northern or Eastern Winds, and never in any other Situation. The Earth is light, crumbly and friable, and though it be subject to accidental Variations of Colour from Admixtures of other Earths among it, and on this Occasion appears sometimes blackish, reddish, or whitish, yet its other Qualities always distinguish it with sufficient Ease: it melts very freely in the Mouth, and leaves a strong Taste of Salt Petre in it.

They collect large Quantities of this Earth, and having prepared several Pits which they line with a firm and tough Clay, they fill them half full of Water, and throw into it large Quantities of this Earth; this soon moulders away to Powder, they then add more Water and stir the whole thoroughly together; after which they let it stand four or five Days. At the End of this Time they open a Hole in one of the Sides of the Pit, and by means of a Channel cut to a proper Depth and lined with the same Clay, they let all the clear Water run out of the first Pit into another, which is prepared in a level Ground, and is inclosed on all Sides, except the north-east, by Walls, but has no Covering at the Top. In this Pit the Action of the Sun and Air by Degrees evaporates the Water, and the Salt which it had before washed out of the Earth, now shoots into Crystals about the Sides of the Pit. These crystals are small and imperfect, as well as impure. They are of the same hexaëdral Figure with the purer Crystals of this Salt, but they are usually without the Pyramids at the Ends, and often too short for their Thickness. They are of a brownish or dusky Colour, and are in this State sent over to us. This is the rough Nitre which we receive from the *East-Indies*.

As the far greater Part of the Nitre used in the World is prepared in this Manner, we are to suppose this Kind of Earth, which is found also in other Countries, to be the true Ore of Nitre, though there are several very different Ways of procuring it beside.

In many Places the Ruins of old Buildings where the Walls are exposed to the North East, and are defended from Rain by being covered at Top, shoot forth an Efflorescence of a nitrous Salt, cold and acrid to the Taste, and in all Respects resembling the common Salt-Petre: This Efflorescence is found much more abundantly in the *Eastern* Nations than any where else, and the Use the People there make of it is this; they do not work it for Nitre alone, but when their Solution made from the nitrous Earth before described will yield no more Crystals, they then throw into the Pit a Quantity of these Efflorescences, and it immediately after yields a large Quantity of Crystals like the first. That this Salt should be found on the Surface of Walls is not wonderful, since it is found only on or near the Surface of the Earth where it is produced; they only cut away the Marl for about a Foot deep to throw into the Nitre Pits what remains underneath this containing no Nitre till it has been exposed to the Air a sufficient Time, and the same Earth where it is discovered, at any thing more than a Foot Depth in digging, never being found to contain a Grain of it.

Earths of whatever Kind moistened and penetrated by the Dung and Excrements of Animals, frequently also afford Nitre in large Quantities. The Earths at the Bottom of Pigeon-houses, and those of Stable and Cow-houses, all afford Nitre, on being thrown into Water and boiled. In *France* where very little Nitre is imported, they make all that is used in their Gun-powder Works, &c. from the Rubbish or old Mortar of Buildings, and the Plaister with which their Houses abound. In Fact, the Mortar of old Walls with us, if moistened with Urine, and exposed to the Air in a proper Situation that is open to the North-East, and covered over to defend it from Wet, never fails to afford Nitre after a few Weeks, and that often in no less a Proportion than that of one tenth of the Weight of the Ingredients: Finally *Hoffman* affirms that it may at any time be extracted from the Air, by exposing an Alkaline Salt to it in a proper Situation, covered over Head from Rains and Dews.

There is no Question but a Manufactory of Nitre might be established in *England* to as much Advantage as that of *France*; though in the Hands in which such Attempts have hitherto been they have not succeeded. The Place where the Materials are exposed is a Thing to be carefully examined: It must be moderate as to the great Points of Moisture and Dryness; if there be too much Moisture, the Nitre which is already formed will be washed away; and on the other hand, without some Moisture the Salts will hardly be form'd at all. Heat and Cold, unless excessive, are of no Consequence.

It is in consequence of the Requisite of so certain a Degree of Moisture, to the Materials from which Nitre is to be obtained, that the North-East Winds are of so much Use in the Production of it; in Spring and Autumn, which are the Seasons when this Salt is principally made, these two Winds are neither too moist nor too dry, especially in the Night; the South and Westerly Winds are destructive because of the Storms and Showers they almost continually bring with them.

The Earths from which Nitre is procured in the greatest Abundance, are found principally in *Persia*, in *China* and the *East-Indies*, and in *Muscovy*; not that other Parts of the World are without them, but in many they are disregarded.

This Earth affords along with the Nitre but a small Quantity of Sea-Salt, though

though there is always some of this with the other. The Rubbish and Earths we boil for it in *Europe* always afford a very large Quantity of it; but they find Ways of separating a great Deal of it before they begin to shoot the Nitre. When the *Lixivium* of the nitrous Earth has been boiled to a certain Degree, they run it into proper Vessels, in which the Sea-Salt shoots into cubic Grains at the Bottom before the Nitre begins to form its Crystals, they then drain off the Liquor thus freed from a great Part of this extraneous Salt into other Vessels, in which it is left to shoot for the Nitre in a cold Place. When they have separated all the Crystals that are there found, they evaporate the Liquor farther and so obtain more: at length they find a large Quantity of an extremely acrid and bitter Liquor, fat and oily to the Touch, which will afford no more Crystals; and this they call the Mother-Water of Salt-Petre, because by sprinkling it on other Earths, they find it disposes them for the Production of more Nitre.

The Crystals of Nitre thus produced are far from the necessary Purity, they require to be dissolved and re-crystallized two or three times to bring them to the requisite Perfection; after which the *French* often melt them over the Fire as we do our *English* Alum, and when a good Part of the Water is evaporated, they cast the whole into Casks. This is what the *French* Authors call Rock or Roach Nitre.

We are to remember that the Salt we have here given the History of, is the Nitre of our own Times only. The *Greeks* and *Romans*, though we meet with the Words *Natrum* and *Nitrum* frequently enough among them, were wholly unacquainted with this Salt, they understood by the Word *Natrum* a native alkaline Salt of a very particular Kind, to be described hereafter, and by *Nitrum* sometimes the same, sometimes other Salts: particularly it seems very probable that they called the native Borax by this Name. They used their Nitre for washing Cloaths, and for making Glafs, as also in their Baths as an Abstergent. These are Qualities which can by no means be supposed to belong to our Nitre; how well they agree with the *Natrum* or Alkaline Salt found native at this Time in the very Places from whence they tell us they had it, will be examined in the treating of their *Natrum*.

Nitre promotes very much the Fusion of Gold and Silver, and is of no ill Consequence in the working those Metals; but as the Sulphurs of the other Metals are not so intimately blended with their Earths as they are in these, it combines itself with them in the Heating and causes a Detonation, by this means carrying off a very considerable Portion of that Sulphur which was necessary to them as Metals, and in consequence of that, robbing them of their metalline Form, and reducing them to a Sort of Calxes much more difficult of Fusion than before. This is easily experienced by throwing a Mixture of equal Parts of Nitre and of Copper, Iron, Lead, or Tin, into a red hot Crucible. Salt-Petre is therefore to be very carefully avoided in all these Processes, unless first calcined itself or burnt to an Alkaline Salt. In the Manufactures it is of great Use; beside being the Basis of Gun-powder, it is used in the making of white Glafs, and is of the same Use as common Salt in the preserving of Foods. In Medicine it is cooling and diuretic, good in burning Fevers, in which it is given with the several Intentions of taking off the Heat, quenching Thirst, and resisting Putrefaction. *Riverius* speaks

speaks of it as a Diaphoretic, and many Authors celebrate it as an Anodyne; but these are Intentions in which it is at present less received. The Ancients had an Opinion that their Nitre was of a caustic Nature: the later Writers supposing ours the same, have attributed the same Virtues and the same Qualities to it, and in Consequence of this Error, have been inventing Means of taking off the Causticity as they call it of this Salt, by burning it with Sulphur, and a thousand other Ways: but it is very certain that purify'd Nitre is better for all medicinal Purposes than any of these idle Preparations of it, when the Salt is intended to be given on those Occasions where its own simple Nature is required.

The Preparations of it in Use in the present Practice are these. 1. *Nitrum Purificatum*. 2. *Nitrum Vitriolatum*. 3. *Spiritus Nitri*, the strong Spirit of Nitre. 4. *Spiritus Nitri dulcis*, the sweet Spirit of Nitre. 5. Aqua Fortis.

NITRUM PURIFICATUM,
Purify'd Nitre.

Take Nitre or common Salt-Petre one Pound, pure Water three Quarts and a Pint: set them on the Fire together, and dissolve the Salt perfectly by boiling: then strain the hot *Lixivium* thro' a double Flannel, and set it over the Fire again in an earthen Vessel. Evaporate it gently till on taking out a little of the Liquor in a Spoon as it cools, there are seen Threads as it were shooting in it: in this State the Salt is ready to concrete. Set it in a cool Place and put clean Sticks across the Vessel, the Salt will form itself into extremely pure and beautiful Crystals on the Side of the Vessel, but principally on the Sticks. Take these out of the Liquor and let the Water drain from them in an earthen Colander, then expose them to the Air to dry, and put them up for Use.

This is the best of all Preparations of Nitre for medicinal Use in its native Form. It readily dissolves immediately on its entering the Body, where it wonderfully cools, and thins the Blood, and gives it a fine florid Colour. In all inflammatory Diseases attended with Condensations of the Blood, this Salt proves excellently cooling and attenuating. It is given from four or five Grains to ten, twelve, or fifteen at a Dose. Some give more at a Time, but it is more adviseable to have the Doses smaller and oftener repeated. It is greatly serviceable in Pleurifies, Peripneumonies, Quinsies, and in inflammatory Cases of all Kinds, in Suppressions of Urine, and in the Small-Pox. In this last Case even a Diarrhœa is not to terrify us from the Use of it; for the Diarrhœas in these Cases are often owing merely to a disordered State of the Blood which this Salt is highly serviceable in the remedying. It is given by many in Hæmorrhages, and it is said with great Effect. If there be any Case in which Caution is particularly required as to the Use of it, it is in a confirm'd Consumption where the Lungs are ulcerated; here its Irritation is to be suspected, at the same time that we know it can be of no Service.

SPIRITUS NITRI,
Spirit of Nitre.

Dry eighteen Ounces of purify'd Nitre and reduce it to an impalpable Powder: put it into a clean Retort, and pour upon it six Ounces of pure and highly rectify'd Oil of Vitriol; place the Retort immediately in a Sand-Furnace, and apply a large Receiver, luting the Juncture with some *Windfor*
O Loam.

Loam. Let the Fire be very gentle at first, the Receiver will nevertheless be full of white Fumes, and a red Liquor will come over in Drops; increase the Fire gradually till it rise to the utmost Heat a Sand-Furnace is capable of; then when no more comes over let all cool: have a Bottle with a Glass-Funnel ready in the Mouth of it, and placed under a Chimney; pour the Liquor out of the Receiver into it, avoiding the dangerous Fumes, and stop it close up for Use. The Receiver is to be stopped also, and reserved for the same Use another Time. It will remain filled for many Weeks with a red Vapour, continually fluctuating and in Motion. The Spirit in the Bottle will appear of a gold Colour, and a red Vapour will fill the Space over it. This Liquor is the true and genuine Spirit of the Nitre alone; it contains nothing of the Oil of Vitriol that was used in the making it, and the Remainder of the Nitre which did not come over in Fumes, remains mixed with that Acid in Form of a dense, white, and neutral Salt, somewhat resembling the *Tartarum Vitriolatum*, and affording the *Nitrum Vitriolatum* hereafter to be mentioned. There is no Method of separating a stronger or a purer Spirit of Nitre than this. *Glauber* was the Inventor of this Method, and he deserves for it the Honour of being acknowledged the Inventor of one of the noblest Discoveries that Chemistry ever produced.

This Spirit is one of the strongest Menstruums in Chemistry. It dissolves Silver and most of the other Metals and Semi-Metals, and even Stones of all Kinds, except those which have Crystal for their Bases; as is the Case in our Pebbles, and in the Agate and Onyxes of other Countries: these are safe from the Effects of all Menstrua till that great *Desideratum* a Solvent for Crystal shall be found. Spirit of Nitre does not touch Gold: it gives a Power of dissolving Silver to many other Acids which before wanted it, as the Spirit or Oil of Vitriol and of Sulphur; but it requires a Mixture of Sea-Salt to give it this Power upon Gold; with that Mixture it becomes an *Aqua Regia*. This Spirit is too corrosive to be given internally in its own Form, but it furnishes us a very valuable Medicine under the Name of a dulcify'd Spirit of Nitre.

SPIRITUS NITRI DULCIS,

Sweet Spirit of Nitre.

Put into a large glass Cucurbit a Quart of highly rectify'd Spirit of Wine, and add to it by a very little at a Time, half a Pound of the strong Spirit of Nitre before described; when the whole Quantity of the Spirit of Nitre is in, fit on a Head, and placing the Cucurbit in Sand, distil over the Liquor so long as what runs from the Nose of the Head will not ferment with an Alkali.

The Caution required in mixing these two Liquors is very great. There is scarce any Mixture capable of such ill Consequences. It emits a suffocating Vapour, and will often burst the Vessels by the Heat and Ebullition it raises, if done too hastily. There immediately arises a fragrant Smell on mixing the Liquors, and the Vapour that is raised from them is almost fiery. It very readily takes Flame if a Candle be brought near it, and bursts the Vessels. If the distilled Spirit be returned in the Cucurbit after throwing away what was left in it and distilled over again, the Mixture is more perfect, and it becomes more fragrant.

It is a very noble Diuretic and Carminative. It is given in the Stone and Gravel with great Success, as also in Jaundices and Dropsies. It is of great Service

Service in restoring the Appetite when depraved by a mucous Flegm. It also allays Thirst. The Dose is from fifteen to thirty Drops in Wine and Water. Prudently used it is excellent for cleaning the Teeth, but if made too free with it destroys them.

NITRUM VITRIOLATUM,
Vitriolated Nitre.

Dissolve the Mass left in the Retort after the Distillation of Spirit of Nitre in the Manner above described, in about eight Times its Weight of Water. Filtrate the Solution, and when perfectly clear, evaporate the Liquor to such a Standard that the Salt will no longer be sustained in it; then set it in a cool Place, and as the Salt shoots collect it, and laying it in an earthen Colander to drain, when well dry'd reserve it for Use. It is of much the same Virtues with the *Tartarum Vitriolatum*, and is frequently sold under its Name.

AQUA FORTIS.

Aqua Fortis is a Spirit of Nitre only differing from the strong Spirit of Nitre before described, in the Manner in which it is made. Beside the Method delivered in that Process which is the Invention of *Glauber*, there is a Way of distilling the acid Spirit from this Salt by mixing it with dry terrestrial Substances, such as Clay, Bole Armenic, Brickdust or the like, which as they make the Salt acquire a much greater Degree of Heat than it can do when fused alone, make it part with its Spirit or Acid. This Liquor as well as the former is called Spirit of Nitre; but when the same Acid is extracted from this Salt by Means of calcined Vitriol, it is called Aqua Fortis. The Method of preparing it is this. Put a Quantity of common green Vitriol or Copperas into an Iron Pot, set it over the Fire, and by Degrees it will melt and smok, and afterwards appear thicker than at first, and of an ash Colour. It is then to be kept stirring about till it becomes perfectly dry; when dry take the Pot from the Fire, take out the Salt while hot, and powder it in a Mortar to an extremely fine Powder; to three Pounds of this calcined Vitriol, add four Pounds of Nitre dry and reduced to as fine a Powder; mix them perfectly together; then put them into an earthen Retort or iron Pot, and set it in an open Fire. Let the Heat be at first gradual; when the Receiver fitted to the Retort or Pot begins to grow warm, continue the same Degree of Fire till all the Flegm is come over, and the Receiver grows cooler. After this encrease the Fire till some yellowish Vapours come into the Receiver; keep it at that Degree two Hours; and finally raise it to such a Degree as will drive out the whole Spirit of the Salt, let the Vessels cool, and in the Receiver is the Aqua Fortis.

The Nitre must be extremely well purify'd for this Purpose, otherwise the Spirit is never pure; if the least Quantity of Sea-Salt be left in the Nitre the Liquor becomes an Aqua Regia, and will take more or less Effect on Gold. Aqua Fortis is a powerful Menstruum. It dissolves many Fossile Substances; indeed all that have not Crystal for their Basis: but it has no Effect on Pebbles, Flints, Sand, or the semi-pellucid Gems; all which are Crystal at the Bottom, however altered by various Admixtures. It also dissolves Iron, Copper, Lead, Silver, Mercury, Regulus of Antimony, Bismuth, and Zink. Tin it acts but weakly upon, not dissolving it perfectly; and Gold it does not touch at all. This Menstruum is often tinged of a greenish Colour which will

will happen from its being some Days exposed to the open Air, and thus deprived of its fuming Spirit, and having afterwards some fresh fuming Aqua Fortis added to it. The same Thing will also happen from its being diluted with Water.

AQUA REGIA.

This Acid, famous for its Power of dissolving Gold, is a Mixture of the Spirit of Nitre and that of Sea-Salt. Take good Aqua Fortis two Pounds, decrepitated Sea-Salt one Pound : put them together into a Retort, and setting it in a Sand Heat, work over the Spirit by gradually raising the Fire to the utmost Heat that Sand can give. The Liquor in the Receiver is Aqua Regia.

As this Menstruum is no more than a Mixture of the Acid of Sea-Salt to that of Nitre, there are beside this, several other Ways of making it, if Sea-Salt, Sal Gem, Sal Armoniac, or Spirit of Salt separately distilled be added to Spirit of Nitre, or to Aqua Fortis, in almost whatever Proportion it becomes Aqua Regia ; that is an Acid capable of dissolving Gold, and not touching Silver. Aqua Regia also dissolves Iron, Copper, Gold, Tin, Mercury, Regulus of Antimony, Bismuth and Zink. It even dissolves Lead more than Spirit of Salt does, but it becomes turbid with it. It does not at all affect Silver, provided the Sea-Salt or its Acid be mixed in it in a due Proportion. If they are too small in Quantity it then corrodes the Silver.

CHAPTER II.

MURIA, *Common Salt.*

COMMON Salt being of infinitely the most Use to us of all the Bodies of this Class, it has pleased the beneficent Author of the Universe to bestow it upon us with an abundant Hand, and to lay it before us in so many various Forms, that scarce any Country can be without an inexhaustible Supply of it under some one of them.

Those who are in the Neighbourhood of the Sea can never want a Substance which its Waters so largely contain, and those at greater Distances are frequently supplied with salt Springs that rise spontaneously at the Surface, or appear on digging a little Way into the Earth ; and where both these are wanting, it is often only necessary to sink a little deeper to fall upon whole Quarries of it in Form of Sal Gem, one Mine of which is sufficient for the Supply of many neighbouring Nations ; not to mention that if any Part of the World could be found out of the Reach of all these Supplies, an accurate Search would probably discover to them Earths and Stones which contained enough of it to furnish them, though at the Expence of some Labour. We have observed that many of the Earths on Analysis yield a little Salt, and in Countries where this necessary Substance is less frequent in other Forms, the Pigeons, a Species of Bird peculiarly fond of this Salt, often have pointed out Places where the Earth contained it in Abundance, by their continually resorting in Flocks to them.

In whatever Form this Salt is naturally found, it appears the same after Solution

lution or Evaporation being pellucid and colourless, not fermenting with Acids, and forming itself according to the Degree of Heat used in the Evaporation and other Circumstances attending it, into either pyramidal, cubical, or parallelipedal Crystals. We find it preserved in the Shops, and ordered in Prescription under the two different Names of fossile and marine Salt, and shall therefore give its History in those two different Forms.

SAL FOSSILIS,

Fossile Salt.

Some confound together the Terms fossile Salt and Sal Gem, but improperly. It is true indeed that they are the same Substance, and so indeed is the Sea-Salt the same with both, though under a different Form; but when we are giving Names to Things merely from their Form, we are to be distinct in them, and to attribute the Term fossile Salt to all culinary Salt found in a solid Form under Ground; but the Name Sal Gem is to be given only to such of it as is of a peculiar Purity, Hardness, and Brightness, and emulates the Appearance of Crystal, or of the pellucid colourless Gems.

The purest and finest fossile Salt, commonly called *Sal Gemmae*, is an extremely bright and very beautiful Fossil. It is considerably hard and firm, of an even and regular Structure; and in the purest Pieces is at least as pellucid as rock Crystal, and at a Distance would be mistaken by any Body for that Stone. As Crystal is liable to many Kinds of Flaws, Spots, and accidental Foulnesses, so is also this Crystalline Salt. It is frequently coloured throughout with a milky white, which takes off greatly from its Lustre and Transparence, and has sometimes Specks and Flakes in it perfectly like those in Crystals; and what brings the Analogy of these Bodies in their Variations from their purer State yet nearer, is, that as Crystal is liable to be tinged to all the Colours of the Gems, as red, blue, green, and yellow, so as to resemble Rubies, Sapphires, Emeralds, and Topazes; so this Salt is also sometimes met with tinged to these several Colours; but with these it rarely preserves the Transparence that Crystal under the same Circumstances does.

This pure Salt is sometimes though rarely found in loose detach'd Masses, these are always of a cubic or parallelipedal Form, and are usually very clear and bright; but it more frequently constitutes Strata in the Earth, of an immense Thickness and Extent. In these vast Beds it commonly appears as one continued and solid Mass of Ice or Crystal, and when broken often is found of an uniform Structure; but sometimes it may be seen to be composed in the Manner of the Spars, of a vast Number of thin Plates or Flakes laid closely and evenly over one another, and often arranged into larger or smaller cubic or parallelipedal Masses, and determining the Salt to split and fall into Pieces of those rather than of any other Figures. These are all the Figures under which that Kind of fossile Salt properly expressed by the Name of Sal Gem exhibits itself.

Under the Name fossile Salt in general we take in, beside this elegant Kind, every other Form under which this Substance shews itself in a dry and solid State under Ground. We often meet with it in large, firm and compact Masses of a tolerably uniform Structure, but debased by an Admixture of various colour'd Earths; sometimes we find it in equally large but looser and more lax Parcels formed of a Number of small Granules not well connected together,

gether, but breaking into a coarse Powder with a moderate Blow. The Granules which compose these Masses are sometimes large, sometimes small, and at some times are so loosely put together that they scarce form a connected Body, but appear merely as a heap of dirty Sea-Salt press'd close together : in all these States the Granules are themselves of irregular Figures and scarce seem the Concretions of a Body to the Crystals of which Nature had allotted any peculiar Form. In this coarser and less beautiful State fossile Salt is as liable to be tinged with the several Colours we have before observed as in the purer Masses, but the Colours are themselves in this Case more dull and dead : a dusky Red is the most frequent of all in this State, whole Beds of it are in other Places also found of a dirty olive or a dead green Colour, enough to frighten People out of the Use of it, but these Colours not only go off after a Solution and Re-crystallization of the Salt, but even often after a mere grinding it to Powder. There are at the Entrances of several of the Mines of fossile Salt a sort of Mills in which as soon as drawn up, it is ground to a coarse Powder to fit it for Use, and it is often observed that the reddest or the greenest Lumps make as white a Powder as the colourless ones.

However different this Salt may appear under its several Forms, it is easily prov'd to be altogether the same on Solution. It always affords Crystals of the Figure described above ; these burst and crackle when thrown into the Fire, and melt when exposed to a stronger Degree of it ; and when fus'd, remain a long Time fix'd and unalterable even in the fiercest Fire. Another Test is the Quantity of Water required to dissolve them perfectly : Every Salt is soluble in the same Menstruum Water, but every Salt distinguishes itself by the peculiar Quantity of that Menstruum it requires to effect the Solution. The Quantity necessary to dissolve perfectly the purest Crystals of Salt is three times and one seventh or eighth their own Weight.

Fossile Salt either in the pure State of what is properly call'd Sal Gem, or in its coarser Kind is found in most Parts of the World, and very probably is in many Places where it is not suspected, the Abundance of it in other Forms rendering it unnecessary to the Inhabitants to dig after it. The greatest Quantities of it known of together, are in *Poland*, where there are whole Mountains of it, as there are also in *Russia*, and in both Places such Stores of it under-ground that Mines may be dug in the solid Beds of it capable of holding Multitudes of Workmen and other Inhabitants. The finest in the World is found in a Mountain of *Catalonia* near *Barcelona*. Near *Wiliska* there are Mines of it which have been opened between five and six hundred Years, where many Families live constantly buried.

Of SEA-SALT,
And that of Salt Springs.

Tho' there are immense Quantities of fossile Salt dispersed throughout the several Parts of the World, the Fossile is however of its two States, that in which it is found by much the least abundantly. The Waters of the Sea and those of Salt Springs contain an infinitely larger Quantity of it in Solution than any the most extravagant Computation can suppose there to be of it solid. The Salt is perfectly the same in the Sea Water and in that of these Springs. But it is mix'd with various other things in both, and is to be separated from them by Crystallization. The Sea Water beside Spar, often contains bituminous Matter of various Kinds in it,

it, and that of Salt Springs though it be more free from this Admixture, yet holds a vast Quantity of a foul and earthy Spar, the same with that of the Sea Water, which is separated from them both in boiling, but in much greater Quantity, even in Proportion to that of the Salt, from the Brine of Springs than from Sea Water.

The Water of the Sea contains in different Parts of the World very different Quantities of Salt, but that of the Salt Springs is always much more salted with it than the strongest of the Sea Water: In some Places it is found loaded with nearly as much as cou'd be made to contain, some Springs yielding a Brine that affords near a quarter of a Pound of Salt from the pound Weight of the Liquor, and many of them being so strongly impregnated that the Workmen are oblig'd to let them down or lower them, by mixing them with a large Quantity of Sea or common Water before they are fit to be boiled for the Salt: the common run of Sea Water does not hold so much as a fourth Part of this Quantity, some not an eighth of it.

The Salt produced from the Sea Water of all Parts of the World, and from the Brine of all the Springs in the World is absolutely the same, but it differs in Strength and some other Qualities according to the Operations by which it is made. In general the quicker the Liquor is evaporated the weaker is the Salt, the more time is employed in the Process, the stronger. This is not wonderful when we consider that over a gentle Heat Water alone or almost alone evaporates from the Liquor, but over a more violent Fire a Part of the Strength or Acid of the Salt is raised with it.

It is upon this Principle and owing to this Cause that we find the Salt of our Salt Springs, which is what is usually sold to us under the Name of Basket Salt, the weakest of all. The common Sea Salt is stronger than that, and the Bay or *French* Salt strongest of all. It is not that there is any Difference in the Waters from which these several Kinds of Salt are produced, that they appear to us in different Degrees of Strength, but that the People who work the Brine Pits have got into a way of boiling off the Liquor as fast as they can in order to make the Salt with less Expence of the Workman's Time; that the Sea-Salt is form'd over somewhat slower Fires; and that the Bay Salt is made only by means of the Sun's Heat, where the Process is very long and the Heat very moderate, and the Salt is found strong in Proportion.

This is so indisputable a Truth that once every Week a very strong Salt, little inferior to Bay Salt in that Quality, is made at the Brine Pit Works where the common run of the Salt is the weakest in the World. The Liquor is the same with the rest in this Case, but the Workmen who do not work on *Sundays* leave a Panful of it to evaporate slowly over the Fire which they prepare on the *Saturday* Night, and the moderate Heat and length of Time under which this weekly Parcel of Salt is made, render it very different from the common Salt of the Works both in Form and Qualities: it is found to be made up of large and hard Grains instead of the small and soft ones of the common Kind, and is vastly superior to it in Strength. This Circumstance overlook'd by the Workmen and even by their Masters too for many Years, gave the Hint to Mr. *Lowndes*, and afterwards to the very ingenious Dr. *Brownrig*, Author of an excellent Treatise on this Subject, to propose to the Government a Method of making a strong Salt fit for all the Purposes for which we buy it of our Neighbours, only
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by a new, that is a slower Way of working our own Brines. The latter of these Gentlemen has proved incontestably that we may, if we will encourage proper Manufactures, have common Salt of every Kind made at home, equal in Strength and equally fit for all Purposes with the Salt of any Part of the World.

After these Accounts of the Muria or common Salt, under its different Forms and as expressed by different Names, it remains to treat of its Qualities and Virtues in general.

It resolves spontaneously in the Air, but this in different Time according to the Dampness or Dryness of that Element, and according to its own laxer or firmer Structure. The coarser Salts dissolve sooner than the finer, and there are even some Pieces of Sal Gem so firm, that they are scarce to be at all affected even on their Surface, by the moistest common Air.

Common Salt added to Aqua Fortis enables it to dissolve Gold, making it into what is called Aqua Regia; by Distillation it yields a strong acid Spirit; it is the most of all Substances endued with the Power of keeping animal Bodies from Putrefaction, and it will also preserve Vegetables in the same Manner in long Digestions. In Medicine it is a common Ingredient in Clysters, and serves to soften and bring away indurated Fæces. Suppositories are also made of a Mixture of it with Honey, and are put up the Fundament to promote a Tendency to Dejections. Aloes and Colocynth are sometimes added on these Occasions when there is required more Power in the Medicine. In apoplectic Cases, it is generally an Ingredient among the stimulating Things administered in Clysters; only it is necessary to have this Caution, that if there appear Reason to suspect an Inflammation of the Intestines, or but a Tendency to it, every Thing of this Kind is to be avoided.

Common Salt that has not been exposed to the Fire makes no Change in the Colour of Syrup of Violets, it does not make any Effervescence with Oil of Tartar, nor does it make Lime-Water turbid, but added to Spirit of Sal Armoniac it manifests some Signs of a latent Acidity by rendering it cloudy: on the contrary also it manifests something of an alkaline Nature by rendering a Solution of Mercury whiteish; and it raises an Effervescence with Oil of Vitriol attended with Heat.

On Solution in Water common Salt manifests also two very different Principles after Evaporation. When reduced to a proper Consistence, that is when the Quantity of Water is not more than as three to one to that of the Salt, a Part of it concretes into Grains of Salt of the ordinary Kind; but there remains yet in the Liquor, after all that can be separated this way has been procur'd, a strong Taste of a saline Nature, the Salt that gives it this will never be brought to crystallize, but must be separated by evaporating all the Liquor away, it is then found to be of an alkaline Nature, assuming no regular Form in its Crystals, and easily imbibing the Humidity of the Air, and running into a Liquor with it.

The Basis of Sea-Salt therefore is a mineral Alkali which is so intimately blended with its peculiar Acid that the latter has scarce any Power of exerting itself. The Acid drawn by Distillation from Sea-Salt turns the Syrup of Violets Red and ferments vehemently, though without Heat, with Oil of Tartar, but it does not heat on being poured into Lime-water. This Spirit is the only one

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that can be properly call'd a Solvent for Gold and for Tin, but Silver and Lead resist it. The Acids of Nitre and Vitriol also obtain the same Qualities on being mix'd with it and become Aquæ Regales. If this Acid be perfectly saturated with Salt of Tartar, Crystals of the Form and Qualities of those of common Salt may be obtained from the Mixture; these Crystals are call'd regenerated Sea-Salt, and serve to prove what we observed above, that an Alkali is the Basis of Sea-Salt, and that more Alkalis than one may serve to that Purpose with the peculiar Acid which is the essential Part of this Salt.

Physicians are of Opinion that Sea-Salt has the same Effects in the Human Body that it has out of it, in checking Fermentation and preventing Putrefaction. They therefore esteem it of good Use mixed with the generality of our Foods in the Stomach: they are of Opinion also that it carries its Effect into the Blood, and has the Qualities of a moderate Dryer, Detergent and Attenuant, added to those of a Stimulant, which common Reason declares it to be. Hence may be deduced all the Virtues attributed to Salt as an aperient, stomachic or warming Medicine, and a provocative to Venery; but in what Degree it possesses all these Qualities we are by its universal Use in Foods prevented from being able to determine. *Van Helmont* recommends it as a good Preservative against the Stone and Gravel: he has been severely censured for this by others, who are of Opinion that all salted Foods, such as salt Beef and the like, are very bad in those Cases: But both Parties may be in the Right: there is a great deal of Difference between common Salt eaten with the fresh Juices of our Food, and the Brine or Pickle into which it runs in the Time of its being left upon the Meat preserved by it. Salt is very properly put into the Mouths of People in Apoplectic Fits as it not only irritates but attenuates the Juices there, and promotes a Discharge of them; and in a Palsy which affects the Tongue a Sage Leaf bruised and covered with Salt has long been a famous Remedy among the good Women, and not without Reason.

Mix'd with Bran and heated in a Canvas Bag it is recommended to be apply'd externally to the Head in Headachs, arising from a moist Cause, and in De-fluxions; and we find the old Physicians very strenuously recommending a Cataplasm made of the same Ingredients for Pains.

The Preparations of common Salt in Use in the Shops are, 1. Decrepitated Salt. 2. Spirit of Salt. 3. The *Sal Mirabile Glauberi*.

SAL DECREPITATUS,

Decrepitated Salt.

Put a Quantity of Salt into an earthen Vessel capable of bearing the Action of the Fire, cover it with a Lid, and set it on a moderately strong Charcoal Fire, heaping up the Coals about it as high as the Salt reaches within; let the Lid be taken off at times and the Matter stirr'd well about with an iron Spatula. It will make a violent crackling for a long Time, but at length the Noise will cease and the Salt will be reduced to a dry Powder; this is Decrepitated Salt. It is used in the Cementation of Metals, in many other chemical and metallurgical Operations; and in the distilling the acid Spirit from the Salt, much Trouble and Time being saved by this previous Calcination, tho' none of the Spirit will be dissipated by it.

SPIRITUS SALIS,

Spirit of Salt.

The acid Spirit of Sea-Salt may be distill'd by the Retort, by mixing two
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Parts of Pipe Clay or any other such Earth, with one Part of Decrepitated Salt, forming the whole into Balls with Water, and distilling these after they are dry'd in a reverberatory Furnace with a coated Retort and large Receiver. But the Method now generally used and recommended by the late College Dispensatory is that of *Glauber's* Invention, in which Oil of Vitriol is added.

Take Sea-Salt and Oil of Vitriol, of each an equal Quantity; common Water a fourth Part of the Weight of the whole; Mix the Water and the Oil of Vitriol together in an earthen Vessel; then pour them into a Retort and add to them the Salt by small Quantities at a Time; fit on a Receiver and distil the Spirit by a Fire, gentle at first, but afterwards rais'd to a considerable Strength. The Mixture of these Ingredients is to be made under a Chimney, and the Vapours carefully avoided, for they are of the most fatal suffocating Kind. This Spirit is used in many metallurgic Operations.

SPIRITUS SALIS DULCIS,

Sweet Spirit of Salt.

Mix together three Parts of rectify'd Spirit of Wine, and one Part of Spirit of Salt, let them stand in Digestion three Weeks or a Month in a tall Matrafs. The Mixture will in this Time acquire a very fragrant Smell, and is to be preserved for Use.

This is given in the same Cases with the *Spiritus Nitri Dulcis*, or Sweet Spirit of Nitre. It promotes the Discharges by Urine, and is recommended in Cases of the Gravel and in Dropsies, and by some in malignant and pestilential Fevers. Its Dose is five, ten or fifteen Drops in any convenient Vehicle. It has also been recommended for the Cure of Hernias, and that in so singular a manner, that the *French* King purchased the Knowledge of the Remedy, while a Secret in the Hands of only one Man, at a very considerable Price for the Public.

SAL CATHARTICUS GLAUBERI,

Glauber's purging Salt.

Take the Cake, remaining after the Distillation of *Glauber's* Spirit of Sea-Salt, out of the Retort and dissolve it in a sufficient Quantity of Water, filtrate the Solution and evaporate it to a Pellicle: set it in a cool Place and the Salt will crystallize in large and fair transparent Shoots.

This is a well known and excellent Purge, its Dose is from half an Ounce to an Ounce. Our Chemists have a Way of counterfeiting it by adding the vitriolic Acid to a Solution of the common bitter Salt, call'd *Epsom* Salt, but this may easily be discovered, the true and genuine Salt being always much fairer and more transparent than this sophisticated Kind. The bitter purging Salt; from which this is thus prepared, is what is usually sold in our Shops under the Name of *Epsom* Salt, and is call'd also *Sal Catharticum Amarum*.

This is made at the Salt-Works in many Parts of *England*, especially where they boil Sea-Water to Salt. After the Salt is shot they find a bitter Liquor remaining which they call *Bittern*. They boil this longer and then set it again to shoot, and by this means procure from it this Salt, which obtained the Name of *Epsom* Salt from its Resemblance of the Salt of the *Epsom* Waters, which is also a Purge.

This is a very cheap Cathartic and is in great Use among the common People. They take it from half an Ounce to an Ounce and Half for a Dose.

CHAPTER III.

ALUMEN,
Alum.

COMMON Salt we have observed is usually found either in its own Form tolerably pure, firm and solid in the Earth or in a State of Solution in the Brine of Salt Springs, or in the Sea-Water. Alum on the contrary does not naturally shew itself to us in either of these Forms. Its natural State is absolutely like that of Metals in their Ores, as they are intimately blended in minute Particles with various fossile Bodies, this Salt exhibits itself to us in extremely small diffeminated Particles, blended among the Substance of Earths and Stones in which it is not at all perceptible to the Eye, but manifests itself to the Taste by its Astringency ; and from which it is easily separable by a Dissolution in Water.

Though this is the only natural State of Alum in the Earth, yet we sometimes meet with it where it discloses itself more manifestly to the Senses in Form of a pure and perfect Salt: we find it in downy or filamentose Excrescences on the Surfaces of some of the Stones which are very rich in it, but this only in small Quantities ; and in some Places Masses of it very white and pure are found in the Hollows of Stone : but in the first of these Cases it is only the Humidity of the Air that has promoted the shooting of the Salt in the Surface of its Ore ; in the other, Water has washed out the Salt and lodged it in those Cavities, from whence the Humidity having been afterwards evaporated, the Salt alone is left there. The *Alumen Plumosum*, and what was suppos'd to be the Native Alum of the ancient *Greeks* hereafter to be described, were of these Kinds.

Alum though blended in its imperceptible Particles in other Fossils is not peculiar to any certain Species, but where it is found at all is generally met with in all the Earths or Stones of whatever Kind they chance to be, that are lodg'd in certain Situations and at certain Depths. If any thing, the Stones are found more frequently containing it than the Earths at the same Depths, but among these Nature seems indifferent as to the Choice of the harder or softer for the disposing it in them. About *Civita Vecchia*, where there are great Quantities of Alum now prepared, and much esteemed for its Fineness, they usually meet with it in a soft greyish Stone of the Nature of our Freestone, though sometimes in a much harder Stone of the Lime-Stone Kind, very nearly resembling some of our *Derbyshire* Stones burnt for that Purpose, which are of a dusky Lead Colour with Blotches of Red in them. These both lie in Strata, but besides these the Country thereabouts abounds with rough Masses of Stone of the Nature of those our Streets are paved with, only that they are less hard. These abound so greatly in Alum that after a Day or two of moist Weather the Salt is frequently seen on their Surfaces in Form of Efflorescences. In *Yorkshire*, where we have a great Quantity of Alum, it is found in a whitish Freestone not unlike the common Alum Ore of *Civita Vecchia*, and often in Lime-Stones, also very like those of that Country. But the greatest Abundance that we have of it is in a black fossile Stone of the Slate Kind. The *Lapis Hybernicus* or *Irish* Slate of the Shops, contains it also in very great Abundance, together with a Vitriolic Salt, and to these two Ingredients it owes its medicinal Virtues.

We have also a blueish and greyish Earth that abound greatly in Alum and are worked for it in some Places ; in *Italy* particularly, about *Puteoli*, Clays and marly Earths frequently are full of it; and finally in the Islands of the *Archipelago* many of the white Clays and of the softer white Stones abound with it, and it is frequently seen there in Efflorescences in Form of Threads hanging from Strata of Stone no way different from our common Freestone.

At our Alum-Works we separate the Alum from its Ores in different manners, according to their different Nature. When they are of the earthy Kind there is nothing done but the boiling them in Water, then separating the clear Liquor and evaporating it to a Standard and adding to it Urine or Potashes. When the Ore is of the stony Kind it is first calcin'd and then boil'd and treated in the same manner. At *Solphatara* and *Civita Vecchia*, where the finest Alum in the World is made, there is no Addition of any Alkali or other Matter to the Lixivium, but they boil the Earths or merely dissolve the Efflorescences in Water and evaporate the Liquor to a due Standard for shooting, and let the Salt crystallize alone: as to the Stones they calcine them gently for about twelve Hours, and then expose them to the Air till they moulder to Pieces: they are then boiled in Water and the Liquor evaporated to a State of Crystallization. These Processes are both without any Admixture, and the Salt separated by them is what we call Roach Alum, and is what ought to be used in the Shops: our *English* Alum may serve the Dyers, but this is what ought to be employ'd in Medicine. There are some Ores of Alum of so remarkable a Kind, that though solid when taken out of the Earth, if heap'd up in large Masses they will by the mere Action of the Air crumble to Pieces, grow warm and smok, and sometimes even burst out into actual Flames: this however is to be prevented by throwing Water on them, otherwise a great Quantity of the Alum is destroy'd. In this crumbly State the Ore tastes very strong of the Alum and is to be boiled for it in the usual manner.

In *Sweden* the same Ore affords both Alum and Vitriol and also Sulphur; and is work'd to Advantage for them all. This Ore is a fine elegant Gold colour'd Marcasite, sometimes variegated with silvery Spots. They heat this gently over a Furnace and then sprinkle Water on it till it burst and fly to Pieces; they then grind it to Powder and work it in large Vessels in a reverberatory Furnace; the Sulphur contained in it is melted by the Heat, and the Mouths of the Vessels being inclined in a proper manner to favour its running out, it is received into a Vessel of cold Water. When no more Sulphur comes over they let the Fire go out and expose the remaining Matter for two Years together to the Action of the Air in Heaps; this takes Heat and even emits a fine thin Flame visible in the Night, though not by Day-light, and in fine calcines by its own Fire to a Kind of greyish or blueish Ashes. They boil these in Water and evaporate the clear Liquor to a proper Standard, when after exposing it to the Cold they find Vitriol in Abundance crystallized from it. When all the Vitriol is shot there remains a thick and fattish Liquor, to which they add a considerable Quantity of Urine and of the Lixivium of Wood-Ashes; a very copious red Sediment is by this means precipitated out of the Liquor; the clear Liquor is then separated and set to evaporate, and the Alum shoots in fine large and pellucid Crystals.

It is evident from this remarkable Proof that the saline Principle is the same in Alum, Vitriol, and Sulphur, and indeed this is farther prov'd by Analysis of
the

the Subjects when separate, the acid Spirit afforded by all three of them being absolutely the same. This acid or saline Principle, as it combines with various other Substances, affords these various Bodies; in this *Swedish* Ore it is evidently lodged in the same Masses of Matter with a bituminous Substance, with an astringent Earth, and with the Particles of Iron; for it is a green Vitriol of Iron, not a blue one of Copper that is separated from it. In the Process for the working it, the Heat first applied mixes some of this Acid with the bituminous Matter, and Sulphur is thus composed, which easily melts and runs out; after this fatty Matter is separated, the Remainder of the Acid, which was at first wholly entangled among it, is at Liberty to act upon what metalline Matter it finds there: It does so, and the Consequence is that Vitriol is formed; and at the same Time some farther Part of it entering into the astringent Earth constitutes the Alum; neither Sulphur nor either of these two Salts having really existed in the Mass itself otherwise than in their Principles.

Nothing is more certain than that Alum consists of a mere Earth reduced to the Form of a Salt by this common Acid; but this Earth is of a very singular Nature, and is perfectly different from every thing of the Kind that we know. For we are not able to produce Alum by Solutions of any of the known Substances in the vitriolic Acid. The nearest Attempt that ever was made to it, I believe, has been one of mine, in which after dissolving a fine triangular Spar in a Spirit drawn by the Retort from the crude Pyrites, crumbled by lying in the Air, but never worked into Vitriol; I produced Crystals of a somewhat austere and astringent Taste, though far from the Nature of perfect Alum.

By which ever of the before described Process Alum is separated from its Ores, it is, when perfectly pure, the same Salt in all its Characters and Qualities. It is either pellucid and colourless, or in Proportion as it is somewhat less pure, it is whitish or reddish, and more opaque; of a sweetish, austere, and astringent Taste, and not easily apt to liquify or dissolve in the Air: It requires a very large Quantity of Water to dissolve it, not less than fourteen Times its own Weight being sufficient for that Purpose. When this Solution is evaporated a little, the Salt shoots again from it, and forms very fair and pure Crystals of an octohædral Figure.

These Crystals exposed to the Fire melt very readily, they then boil and foam up, and emit a great Quantity of Phlegm, and afterwards burn into a light spongy white Mass, which is what we call burnt Alum. But if this Process be performed in a Retort, and the Fire encreased, after all this an acid Spirit is distilled, which is absolutely the same with that of Vitriol or of Sulphur: What remains in the Retort, after this Spirit is all driven over, is a light and fœculent Matter, containing a Quantity of a fine Earth of the Nature of Bole.

This Earth calcined with three Times its Quantity of Charcoal makes a Phosphorus, which takes Fire very readily of itself on being exposed to the Air.

The determinate Figure of the Crystals of Alum, when pure and nicely procured by a cautious Evaporation, is that of a triangular Pyramid, the Angles of which are cut off, so that it is composed of four hexagonal and four triangular Superficies. A Solution of Alum curdles Milk; it makes no Change in a Solution of corrosive Sublimate, and mixed with an Infusion of Galls it renders it turbid and whitish; it also gives the same whitish Colour to Lime-Water.

Mixed

Mixed with Oil of Tartar *per Deliquium*, it forms a white *Coagulum* without any Heat or Fume; but if the Alum be of that Kind in the Preparation of which Urine has been used, there is always a urinous Smell from this Mixture. This therefore is a very good Test to prove whether the Alum be of the *Roman* or *English* Kind.

Beside the Ores of Alum which we have described, and the Alum separated from them in these various Manners, we meet with Accounts in all the old Writers of native Alum found pure and in its own Form. This native Kind was what the ancient *Greek* Physicians used, but at present we know of no such Substance in the Shops, all that we use being of one or other of these factitious Kinds prepared by Solution and Evaporation, either alone or with the Mixture of an Alkali. We have before observed that whatever has been met with under the Name of native Alum, has been improperly so called. The Places it is found in are in the Islands of the *Archipelago*, and the Place now called *Sulphatara*, the *Phlegræan* Fields of the Ancients. In the latter of these Places the Earth is full of Alum, Sulphur, and Vitriol; and in moist Weather, Efflorescences of Alum rise up out of the Earth and are swept together in Heaps, and dissolved in Water, and Alum in Crystals is produced from them. In the former these Efflorescences are yet more abundant: There are there whole Quarries of Stone rich in Alum, and from the Cracks of these there hang the same Sort of Efflorescences longer and more firm than those of *Sulphatara*. These are White and of a very astringent Taste, and are composed of Multitudes of fine slender Fibres; this is what is called *Alumen plumosum*, but this is no more native Alum in the Sense in which a Naturalist would use that Term, than the Efflorescences on the Surfaces of the *Pyritæ* are native Vitriol.

These Specimens were what the *Greeks* called *Trichites*, as if composed of Hairs: beside this they distinguished another Kind found principally in the Island of *Milo*, by the Name of the *Schistum*. This was found at their Time, as it is to this Day, in Form of ash-coloured Masses of dusty Surfaces and an irregular Structure; these are only met with in Hollows of the Rocks, where Water that had in its Passage through the Strata dissolved some of the Alum they contain, has stood to evaporate, and left the Salt behind it in these Cakes.

The *Greeks* tell us of native liquid Alum also. It is easy to conceive that where Water has passed through the Cracks and Fissures of Stone, in which Efflorescences of the Kind above mentioned were produced, it should dissolve them in Abundance. This Water thus sated with aluminous Matter was catch'd as it dripped from these Fissures, or suffered to run into Hollows, whence it was taken. This was what they called liquid Alum, and as it was pure or mixed with the fine light Marl, or *Lac Luna*, produced in great Abundance by those Stones, and easily washed off by Water, it appeared either pellucid, or milky, and was accordingly distinguished into two Kinds. Where it was not taken up in this liquid Form, it either ran to Waste, or was detained by accidental Cavities in the Rocks, and was the very Liquor which evaporating made their solid native Alum. These Masses of Alum from the Shape of the Cavities they were formed in, acquired a roundish Form and were called thence also round Alum. This also, from the accidental Variations it was subject to from the quicker or slower Evaporation of the Water, they divided into
three

three Kinds, the one of which was of a loose and spongy Texture, full of Bubbles on the Outside, and of little irregular Cavities within; this they called the pumicose round Alum. Other Masses of it were more firm and solid, and of an uniform Structure; these they called, from their Resemblance to the tuberous Roots of the Astragalus, the astragaloide Alum; and other Masses, which were of a middle Degree of Density between these two, and were formed of Crusts or Flakes, they called *Placitæ*. The first of these had been form'd by a quick Evaporation of the Water which the Alum was before dissolved and suspended in; the second by a slower Evaporation, in which the Particles of the Salt had Liberty to get closer together: on the Surfaces of these Masses the Roughness we before spoke of was most frequent, and was composed of imperfect Crystals of the Salt. The third Kind of Masses were formed by several repeated Evaporations, of new Quantities of Water, highly loaded with the Salt; each of which, without dissolving the Mass already formed, evaporated over it, and form'd a new Crust there.

These were the Alums known to the Ancients, and they are all still found in the Places where they met with them, and probably in many others where the Ore is a hard Stone, and where there are Lodgments for the Water that drips from it.

Alum is to be chosen for medicinal Use in fair and clear Pieces, of a faint reddish Tinge throughout. The *English* Alum never has this true Tinge, but is white or pellucid.

The *Greeks* called Alum *Stypteria*. At present we distinguish the several Kinds of it principally by Names formed from those of the Places where it is made. The *Roman* is best, that of *Liege* is next after this, and the *English* for medicinal Use worst of all. The Foreigners call ours *Alumen Glaciale*, or icy Alum, from its Transparence and icy Look, and are much surprized at the vast Size and irregular Figure of the Masses of it; but this is owing to our Way of preparing it for Sale. In other Places they pack it up in Tubs as they take it out of the Fats where it has shot; but with us it is after taking out of these Vessels dried and melted over the Fire, and in this fused State is run into the Tubs, which it therefore fills with one uniform Mass like a Rock. We are to observe that beside the several Kinds, as they are called, of true and genuine Alum, Authors have very improperly and absurdly given that Name to several other Substances wholly different from it: among these we find the common *Lapis Specularis* called *Alumen Squamosum* or *Scaliolum*, and a peculiar Species of the *Amiantus*, call'd *Alumen Plumosum*. This last indeed has been owing to the Blunder of some who took that Fossile for plumose Alum, though as unlike it as two Things well can be in its Qualities. A third Kind of Alum, according to these Authors, is the *Alumen Catinum*; but this is only the common Potash or the Alkali Salt produced from the Lees of Wine burnt. This is indeed a Salt, and so far approaches to the Nature of Alum, but is different from it in its Nature, Origin, and Qualities, as one Salt can be from another; but the other two Substances have less Claim even than this to the Name, being Fossils of the stony Kind, and not soluble in Water, nor in any thing approaching in the least toward the Nature of the Salt, by the Name of which they are called.

The *Alumen Jameni* of the *Arabians* is the Efflorescence of Alum, called by others

others *Alumen Plumosum*; this when genuine deserves all the Praises they bestow upon it, as possessing all the Virtues of Alum in their highest Degree: But it would be a very fatal Error to give the Amianthus, usually met with in the Shops under its Name, internally in its Place.

The chemical Characters of Alum are these O or □.

In Medicine it proves a very powerful and valuable Astringent. *Dioscorides* and the other old *Greek* Authors are full of its Praises in stopping Hæmorrhages of all Kinds, and in fastening the Teeth and strengthening the Gums. It was an Ingredient in all their Dentrifices on this Account, and obtains a Place in most of ours also to this Day. It is also a gentle Desiccative, and is good externally in Ulcers. We are fond of it also internally at this Time, in Cases of Bleedings from whatever Part. The best Method of giving it is in Pills, its Taste being a very displeasing one in a Liquid Form. There is a very good Method of making Pills of it by melting it over the Fire, and adding to it, while in Fusion, a fourth Part of its Weight of Dragon's Blood in fine Powder. The Mass is to be taken from the Fire as soon as the Powder is well mixed in it and made into Pills before it cools. These are to be given half a Dram for a Dose, and in Extremity are to be repeated in the same Dose every three or four Hours, and after the Hæmorrhage is stopped, they are to be repeated once or twice a Day for some Time. As it is not right however to be too sudden in the stopping Evacuations of this Kind on some Occasions, it is necessary to bleed sometimes both before and after the Use of this Medicine; and as it is apt to prove an Astringent in the Bowels, an emollient Glyster ought to be occasionally given during the Use of it.

A Gargarism with a large Quantity of Alum in it has often proved a Remedy in the Beginning of Quinseys, which might else have had fatal Consequences. Three Drams of Alum may on these Occasions be dissolved in a Pint of Water, and the Mixture sweetened with Syrup of Mulberries, to take off somewhat of the bad Taste of this Salt.

The white of an Egg beat up into the Form of an Unguent with a Piece of Alum, which is easily done, makes an excellent Liniment to apply over the Eyes in Cases of Inflammation and Defluxions upon them; but it ought not to be suffered to remain too long on them.

In scorbutic Disorders of the Gums Alum is found excellent; it is very conveniently used in Form of a Lotion on this Occasion. Four Ounces of Sugar, two of Alum, and one of Camphire, macerated in a Quart of Brandy make an excellent Lotion of this Kind.

Alum heated red hot among burning Coals and immediately plunged into Vinegar, will dissolve in it; and on Evaporation will form very clear and fine Crystals. These are recommended in intermittent Fevers, a Scruple or more for a Dose, to be given just before the coming on of the Paroxysm.

The Preparations of Alum received at this Time into the Shops are only, 1. The purified Alum. 2. The burnt Alum. 3. The Sugar Alum, or *Alumen Saccharinum*. And 4. The *Aqua Aluminosa*, or Alum Water of *Bates*.

ALUMEN PURIFICATUM,

Purify'd Alum.

Take *Roman* Alum four Ounces, fair Water four Pints; dissolve the Alum over the Fire, and filtrate the Solution. Evaporate a little more than one third

third Part, and set the Remainder in a cool Place: fine pellucid Crystals of Alum will be formed which are to be separated, and the Liquor farther evaporated, and set to shoot more. These are greatly preferable to the common rough Alum for all Uses in Medicine.

ALUMEN USTUM,
Burnt Alum.

Put a Quantity of Alum into an earthen Vessel that will bear the Fire; set it over burning Coals, and the Salt will melt and rise up in Bubbles; let it stand on the Fire till it no longer swells, but remains a dry spungy Mass. The watery Part of the Alum is in a great Measure expelled by this Process, and the Remainder is left possess'd of all its Acid less clogged, and more in a Condition to exert its Effects. It proves a very gentle Escharotic, and is used in small Quantities mixed with other Ingredients in Tooth Powders.

AQUA ALUMINOSA,
Alum Water.

Take Alum and white Vitriol, of each half an Ounce, Water a Quart. Dissolve the Salts by boiling in the Water, and filtrate the Liquor for Use. It is used externally to wash old Ulcers and sometimes in Injections.

ALUMEN SACCHARINUM,
Saccharine Alum.

Take common Alum four Ounces, Water one Pint, the Whites of six Eggs; dissolve the Alum in the Water and let it almost cool; then beat up the Whites of the Eggs in it and boil it again, stirring it all the while till it is stiff enough to be worked into any Form. This has usually been formed into the Shape of Sugar Loaves, and tied up in the same Manner in blue Papers, and hence it obtained the Name of Saccharine Alum. It has been used externally in Washes for the Face, but is now little known.

C H A P T E R IV.

B O R A X,
Borace.

THE Borax of the Shops is a native Salt procured by the Evaporation of certain Waters in which it is found suspended. It is sometimes sent to us just as prepared by the first Evaporation, with a great Deal of Foulness about it; but more frequently we meet with it as purify'd by subsequent Solution and Evaporation.

In the first of these States it is called rough Borax, in the latter refined Borax, or *Venetian Borax*; from the Place where it used to be refined, and whence it was dispersed over *Europe* for medicinal Purposes and for the Artists.

The rough Borax is a Salt brought to us in Form of little Masses of an irregular Figure, but somewhat prismatical. They are about the Bigness of a small Walnut, seldom larger, though sometimes smaller; of a dusky greenish Colour, very foul, earthy, and fattish, and of a rank and disagreeable Smell.

The refined Borax is usually met with in Form of a clean whitish or pellucid Salt, somewhat resembling Alum in the Figure of its Crystals, when they

are perfect; though few of them are so, or indeed any Thing approaching to it: It is of a bitterish and disagreeable Taste, which leaves however somewhat of a Sweetness at its going off. It requires a great Quantity of Water to dissolve it, not less than twenty Times its Weight being sufficient for that Purpose. Exposed to the Fire it swells into large Blisters, and discharges a great deal of Water as they burst; afterwards it runs into Fusion, and is thin like Water. If taken from the Fire in this State, and suffered to cool, it has the Appearance of Glass, and is much more difficultly dissolved in Water than before. On Distillation it affords only an insipid Phlegm. It does not make the least Effervescence either with Acids or with Alkalies, but very readily unites itself with the Acid of Vitriol, and forms together with it an almost insipid and volatile Salt.

A Solution of Borax changes the Colour of Syrup of Violets to a beautiful green. Thrown into a Solution of corrosive Sublimate, it makes it of a reddish yellow, or deep Orange Colour; and mixed with a Solution of Sal Armoniac it emits an urinous Smell. It appears from all this, that Borax is a fixed alkaline Salt, but that of a very singular Kind, in that it does ferment with Acids. From this Instance may be seen also the great Use of these several Tests by Mixture with other Liquors, for the distinguishing the true Nature of Salts; since we find by them what the common Trials, such as the fermenting or the not fermenting with Acids, though supposed to hold universally in regard to Bodies alkaline and not alkaline, is not able to discover to us.

We have already observed that Borax is not found naturally in a solid Form, but is prepared for us by Evaporation from certain Waters. The Method of doing this among the *Persians* is too singular to be omitted in the History of the Drug. In many Parts of the *East* there are Mountains which contain the Ores of several Metals, particularly of Copper, which are not dug for, though they sometimes offer themselves almost at the Surface. From the Sides of several of these Mountains however there issues out a thick and foul Water, usually of a greyish Colour, though sometimes greenish, blueish, or reddish, or of other Tinges which it takes up from the Earths, or other Bodies it washes as it runs along. The greyish is however its natural Colour; it is of a very nauseous Taste, brackish and bitterish, and with somewhat of an urinous Flavour of the Nature of that of the alkaline Salts. It generally brings away with it a Quantity of blueish Mud, and has often a bituminous Matter also floating on its Surface, and forming a thin Skin, reflecting a Variety of Colours. Where this Water is in sufficient Plenty it is preserved for working into Borax, which Salt the People know it always contains. They form several shallow Pits in the Earth about the Sources of this Water, and lining them with a stiff Clay that will not let any Liquor through, they let the Water into them, and leave it exposed to the Action of the Sun and Wind to be evaporated; from Day to Day however they are at the Pains of scooping up the blueish Mud which this Water has brought out of the Mountains with it and deposited in its Channels; this they carefully mix with the Water that is evaporating in the Pits. They keep this mixed up in the Fluid by frequent stirring; and in fine, as the Water more and more evaporates, it becomes more loaded with the Salt, and is able to retain more of the
Mud,

Mud, till at length the whole becomes of a greenish Blue Colour and of the Consistence of Pap.

The bituminous Matter is from Time to Time carefully skimmed off from the Surface of the Liquor, before it arrives at this State. When it has stood some Hours perfectly mixed with its Mud and of this thick Consistence, they melt a large Quantity of animal Fat of any Kind over a very gentle Fire, and in the middle of the Day, when the whole Mass of Matter is itself warm, they throw this melted Fat into it, and immediately work it thoroughly about to mix the whole perfectly together. This is no sooner effected, than every Thing being ready at Hand, a thin Crust of dry Vegetables, as the small Branches of Trees or the like, is thrown over the whole Pit; and over these is spread a thin Coat of the same Clay that was used in lining the Pit. In this Condition the Matter is left to the Action of the Sun and Air for five or six Days more; at the End of which Time they begin to try about the Edges whether the Matter is dry. When it is found to be so, the Covering of Clay is taken off, the Branches of Trees are removed, and there is found a light friable Matter somewhat like a fine garden Mould in the Bottom of the Pit. This is broken with small Blows of a Spade, and is sifted through wire Sieves. The earthy Matter easily runs through the Sieve, and the Salt remains behind in Form of those irregular and foul Crystals, which we call native or rough Borax. This is the general Origin of what we call native Borax. It is however sometimes found in a solid Form in small Quantities, encrusting the Sides of the Stones the Water has run by in its Course with small Masses of a greyish green Colour, and which on Trial appear to be true and genuine Borax. Sometimes also the Rocks which cover the Springs have fair octohedral Crystals concreted on them of a fine pellucid Appearance, these are not however to be supposed naturally solid Forms of the Salt, but are only Crystallizations of it from among the Water made by the Sun's Heat.

It is not a Wonder that all *Europe* did not fall into the Way of purifying Borax for medicinal and other Uses at once, since there is no Salt in the World in which the Process for doing that is so troublesome. The common Methods will indeed dissolve it in Water, and Evaporation will separate it again, but that not in a Form fit for Sale, or in large and fair Crystals. This is only to be done by a Process like that by which it is originally prepared from the Water of the Mines. When it has been dissolved and the Solution properly evaporated, it is not to be exposed to the cold Air in a still Place as other Salts are in order to the crystallizing, but it is to be kept in the hot Vessels and covered close down in them, and the Fire is to be continued under them, tho' only in a gentle Degree. By this Means we are able to imitate here the Sun's Heat in the Countries where it is produced, and the Clay cover which the People who work it, extend over it at the Time when it is to crystallize; and the Effect is the same: The Salt shoots into large Crystals about the Sides of the Vessel, and about brass Wires, let down from the Lid into the Liquor.

The Borax is by this Means purify'd from a great deal of its fatty Matter, the separating of which renders the Operation very offensive, but it is not yet pure; it is yellow and foul even in these Crystals. These are to be separated from the Liquor, and again dissolved in a *Lixivium* of Potashes and Lime; and then on being set to shoot again in the same Manner as before,

it forms itself into those pure and pellucid Cryftals, which we meet with in the Shops.

These when perfectly formed, as they seldom are indeed except by a very nicely managed Evaporation, are of an octohedral Figure and very pellucid. They are of a very rude and irregular Shape as they generally shoot, and the Process of recryftallizing them not being easily hit upon by those who had not been informed of the Manner of it, many have sought a long Time in vain to find what was the true Figure of this Salt.

The rough, or as it is called native Borax, is to be chosen in firm and solid Pieces of a greenish Colour, and fatty to the Touch, and of the most rank Smell: and Care is to be taken that no Dirt or Stones be mixed among the smaller Pieces of it. The refined Borax is to be chosen the most pellucid and colourless that may be, and in the largest and most regular Pieces.

It is not only by the Changes this Salt makes in different Tinctures and Solutions that it shews itself to be of the Nature of the alkaline Salts, it has like them a Power of running into Glafs with Cryftals and Sand, and that a much finer Glafs than is to be produced by any other Salt. It is on this Principle that the artificial Gems which I have made of the Colours of the several natural ones, excell the common Compositions of this Kind as much in Hardness as in Lustre. The People who have cut them assuring me that the coloured ones, in which it has been necessary to use some Lead, are nearly as hard as Cryftal, and that the white, in which no Lead has been used, is full as hard as the Cryftal it was form'd of.

Borax promotes in a very remarkable Manner the melting of those Metals which are not easily put in Fusion, as Gold, Silver, Copper, Iron, and Regulus of Antimony, and yet it diminishes them very little. It is therefore of great Use in metallurgic Operations where metalline Particles disunited yet in their true and perfect metalline State are required to be reduced into one Mass by Fusion.

Gold or Silver when mixed with any of the other Metals, when they are to be separated by Fusion, generally lose a Part of their Quantity by having small Masses of them imbibed among the Scorix raised from the other Metals and carried off with them; but this is greatly prevented by Borax, which promotes the Fusion of the whole Mass the more suddenly, and by that means gives the heavier Metals an Opportunity of sinking more readily to the Bottom; and also vitrifies the Scorix, and renders them incapable of sustaining the Gold or Silver as they would have done.

It is a very good Practice also to rub with Borax the Insides of Crucibles, in which small Quantities of the nobler Metals are to be melted. All Crucibles are full of Pores, which may take up a small Quantity of the Metal melted in them, but which are thus filled up beforehand by the Borax, which runs into a Kind of fixed Glafs, and gets into every the smallest Cavity.

Gold melted with Borax loses a great Part of its Colour and becomes very pale; but it is readily restored to its true Colour again, or the Effect of the Borax in this Way may be prevented, by adding in the Fusion a small Quantity of Sal Armoniac, or of Nitre; both these Salts however are not to be used together, because there would be a Detonation.

The metallurgic Writers generally rank Borax among the Class of reducing Bodies, or those which serve to reduce the Metals when destroyed to their true
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and proper Form; but this is injudicious, for it has no Power of reducing the destroyed Metals; all its Effect is the bringing together the scattered Particles into a Mass, when they yet retain their true metalline Form.

As to its vitrifying Power, I know of no simple Earth, nor any Stone of a crystalline Basis, which it will not run into Glass by being powder'd and mixed with it. But it is convenient to use Borax that has already been melted into its glassy Substance for this Purpose, because it is otherwise troublesome by its swelling and rising in Bubbles while melting.

We have a Custom of calling this Salt by the Name *Chrysocola*, a Name used by the old Greek Writers for a Substance as different from our Borax as any two Things well can be from one another; only agreeing in their common Use, which is the soldering of Gold. The old Writers indeed distinguished two Kinds of *Chrysocola*, a native and a factitious, and this with People who are contented with the Sound of Words without troubling themselves about their Signification, has served also to confirm the Blunder of ours being the same, because we also have a native, as it is called, and a factitious Borax. The native *Chrysocola* of the Ancients was a sparry Substance so highly impregnated with Copper, that it might very well be called a Copper-Ore.

It was found in Form of Powder, or of a green Sand in the Mines of that Metal and in those of some others, but, as the Ancients observed, never unless there was Copper among them.

It is still found in the same Form, and that not only in the Mines, but on the Shores of the Sea and Rivers. Sir *Hans Sloane* has some of it from the Shores of *New England*; and I have received it from *Russia*; in both which Places it is evidently the same Substance, answers to the same Characters, dissolving in Acids, and giving a green Colour to them which is converted into a blue by the Mixture of an Alkali, and serving extremely well to the same Purpose for which the Ancients have recommended it, the soldering of Gold and of other Metals.

This was the native *Chrysocola* of the Ancients, a Substance sufficiently different from our rough or native Borax, as it is called, nor was their factitious *Chrysocola* less different from our refined Salt of that Name. This was also of two different Kinds, the one of them a Preparation of the native *Chrysocola* just described, the other a Preparation of Verdigrease.

When the Ancients used their native *Chrysocola* in its pure genuine State, all the Preparation they gave it was the reducing it to fine Powder, and separating it from all extraneous Substances: both these Ends they obtained by one Operation. They ground the native *Chrysocola* as they took it from the Mines in Water, and as it was naturally fouled with Earth or other accidental Admixtures, these separated from it in the grinding of it, and were pour'd off with the Water; this Operation was repeated till the Water remained clear after ever so much rubbing it, and it was then dried for Use, being rendered sufficiently fine for common Occasions by these several Rubbings in the Mortar. Some of it was found when thus cleaned and dried to be of a fine strong green like that of the Emerald; this was esteemed most of all. Some again was pale and whitish, which they valued least of any; and some again of a middle Colour and middle Value between these. If they required it yet finer they very gently calcined it over the Fire, and then ground it with Water as before.

The factitious Kind prepared from this genuine *Chrysocola* they called *Herbacea*,

bacea, from its being tinged with the Juice of an Herb, and *Orobites* from its being made up for drying in little round Balls like Peas. They ground the calcined *Chrysocola* to a fine Powder, then macerated it for some Days in Vinegar, and afterwards ground it again with that Liquor, then washed it and dry'd the fine green Powder; they then added to it a Quantity of Alum and the Juice of the *Lutea Herba*, and made it into a Paste which they dry'd in these little Balls.

The other factitious *Chrysocola* was made from Verdigrease, and seemed to have no other Reason for its being called so, but that it was of the Colour of this. They called this *Santerna*. It was made of the finest Verdigrease ground in a Copper-Mortar with the Urine of a Boy, and sometimes with the Addition of a little Nitre, sometimes without. They sometimes also prepared it with Urine only in the Mortar, letting it remain there till it had extracted the Rust of the Copper, and made a peculiar Kind of Verdigrease. The usual Way however was to grind the Verdigrease and Urine together a long Time in a hot Day, till the whole acquired the Consistence of a Paste. *Dioscorides* very properly places this *Chrysocola Santerna* among the Kinds of Verdigrease, but *Galen* and some others tell us that the Goldsmiths used it in soldering.

It is sufficiently evident from this, that the *Chrysocola* of the Ancients was no Way related to our Borax. It was a green Copper-Ore in Form of Sand, and as to its Virtues we are informed by *Dioscorides* that it was a violent Emetic, and had sometimes occasioned Death.

Theirs also, as we find by their Manner of preparing it by washing and grinding in Water, was not soluble in that Fluid, and consequently was not a Salt as ours is.

The Borax or *Tincar* of the *Arabians* seems to have been very different from the ancient *Chrysocola*, and may have been perhaps the same with our Borax, but we have not enough left about it to determine that with Certainty. It was brought from a different Part of the World from that of the present Times, but that is no Proof that it was not the same. The *Greeks* of old Time express a peculiar Salt by the Name of *Nitrum* very different from their *Natrum*, the *Arabians* called this Salt *Baurach*, and the modern *Greeks* in Imitation of them have called it *Borach* and *Borachion*; and finally from them the *Latin* Writers of the barbarous Times *Borax*. This is the Origin of the Name Borax; and this Name among the first People who used it, signify'd what those of earlier Times called *Nitrum Africanum*, the *African Nitre*. The Word *Tincar* is also truly *Arabic*, and denotes, as the Authors themselves say, a Kind of Nitre which was used for the soldering of Gold. This is a very likely thing to be said of our Borax, which in external Appearance sufficiently resembles Nitre, and whose great Property and Use is that of soldering Gold: and from this Account of the *Arabians* of their *Tincar* it has been that the later *Greeks* have called it *Chrysocola*, confounding it, because of its similar Use in soldering, with a Substance so very unlike it in all other Respects, as the *Chrysocola* of the Ancients. *Scrapio* goes so far as to talk of a refined Borax which must have been like ours of the Shops, he calls the rough or native Borax a Species of Nitre or of *Aphronitrum*, and tells us that their *Tincar* was prepared from it. A very natural Account of Borax for the Times in which he wrote.

Its Use in Medicine is principally as a Stimulant, Emmenagogue, and Diuretic; it is one of the most powerful Medicines we know in Suppressions of
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the Menfes, and is given with great Succes to promote Delivery and to bring away the Secundines. It is usually given with Powder of Myrrh and a few Grains of Saffron. Its Dose is from five to fifteen Grains, some Writers talk of much larger Quantities, but they are neither safe nor necessary. It is also used by the Women as a Cosmetic. The great Consumption of it however is for soldering, the Workers in all Kinds of Metals having Recourse to it on this Occasion: and the Dyers, if it were not too dear, would consume a great Quantity of it to give a Gloss to their Colours.

CHAPTER V.

SAL ALKALINUS AQUARUM MINERALIUM,
The Alkaline Salt of Mineral Waters.

THIS is a Salt which never offers itself to us in a solid Form, and which the World has been very little acquainted with the Characters and true Nature of, though much indebted to its Effects; for it is by Means of this in a great Measure that the mineral, and particularly the chalybeate Waters, obtain their Properties. We find no other Alkali except this in them, and we are very well assured from Experiments, that there is no Way of impregnating common Water with the other Particles it contains, when in the State of these celebrated Waters, but by means of an Alkali; nor indeed is it easy to account for the Properties of many of them without allowing them a Principle of this Kind.

This Salt is never suspended in any large Quantities in any Water, it is scarce discernible even in those which contain most of it, as the *Pyrmont* for Instance, by its Taste, and it is very difficultly separable from them. Its true Figure however, when procur'd separate and regularly crystalliz'd, is that of a quadrilateral Column, terminated by a short quadrilateral Pyramid; but the Crystals are very minute.

The Method of procuring it separate is this. A large Quantity of some of the chalybeate Waters, the *Pyrmont* for Instance, for that yields most of it, is to be evaporated in a Sand-heat with a very gentle Fire to a Dryness, there will be found at the Bottom of the Vessel a small Quantity of an earthy Matter, which when tasted gives evident Testimony, by its brackish and bitterish Taste, that there is a Salt contained in it. This Matter is to be ground in a glass Mortar with a small Quantity of distill'd Water, and after standing in a Sand-heat three or four Hours that the Water may take up all the Salt, it is to be filtrated and set again in the Sand-heat: if it be kept there till the Water be all evaporated there will remain a whitish Salt very much resembling Salt of Tartar, but if it be only evaporated to a Pellicle and then set by in a cool Place, the Sides of the Glass will be found incrusted with a Circle of whitish Matter where the Top of the Liquor has reached; this Substance is to be carefully separated with the Point of a Penknife, and when examin'd by the Help of a Microscope it will be found a semi-pellucid Matter, containing many Crystals of a pure Salt of the Figure we have already described. There are but few perfect ones however, the far greater Number of them running together into little Fasciculi blending with one another and destroying their Forms.

The Salt separated either this Way or by an absolute Evaporation, which is
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much the easier, has all the Characters of a true fix'd Alkali. Mix'd with a green Solution of Copper it turns it Blue. With an Acid it raises an Effervescence and forms a neutral Salt, it turns Syrup of Violets Green, it precipitates a yellow Powder from a Solution of corrosive Sublimate in Water, and with a Solution of *Sal Armoniac* it emits an urinous Smell.

The chalybeate Waters all contain more or less of this Salt, and in general more of it may be separated from them in Proportion as they are more strongly impregnated with the Metal. We have a Proof of the Use of an Alkali on this Occasion, from the making of the artificial chalybeate Waters, which is no Way to be so well done as by means of a Solution of the common vitriolic Pyrites in Water, impregnated with the common fix'd Alkali of Tartar.

The earthy Matter separated from these Waters, together with this Salt, is usually a Mixture of a marley Earth, an Ochre, and of that common Spar which is contained in all Water, and which encrusts our Tea-kettles and other Vessels in which Water is frequently boil'd.

CHAPTER VI

NATRUM, *The Natrum of the Ancients.*

THIS is a native Salt extremely different from our Nitre, and indeed from all the other native Salts, being a fix'd Alkali, plainly of the Nature of those made by Fire from Vegetables, yet being capable of a regular Crystallization, which those Salts are not. It has indeed been very freely asserted that no fix'd Alkaline Salt can crystallize, but the Authors who have affirmed this have form'd their Opinions from those fix'd Alkalis made by Fire: indeed when we come to enquire with a proper Accuracy into these Subjects, we shall find that the true Characters of alkaline Salts are not yet establish'd, and that those generally deliver'd as such are not so just and invariable as has been supposed. It is affirm'd by Authors that a fix'd Alkali is a Creature of the Fire and can exist no where naturally; and yet more confidently is it affirm'd that the great distinguishing Character of all Alkalis is their raising an Effervescence with Acids. We find on the contrary that this Natrum and the alkaline Salt of the chalybeate Waters are true Alkalis, scarce distinguishable in their Taste and Qualities from Potash or Salt of Tartar, and yet that they both regularly crystallize into uniform invariable Figures; and as to the other Property, we find that Borax, though possessed of many of the distinguishing Characters of Alkalis, yet does not ferment with Acids. This Salt, as has been observed under its proper Head, turning Syrup of Violets Green, a Solution of Sublimate Yellow, and diffuses an urinous Smell on being mix'd with *Sal Armoniac*; and yet tho' these are three of the four great Tests of an Alkali, not exhibiting the fourth, not at all effervescing with any vegetable or mineral Acid.

After premising thus much as to the Uncertainty of the Characters of Salts established as certain and invariable, we may venture to describe the Natrum as it is, though it be necessary in that Description to contradict the common Opinions.

The Natrum or Nitre of the Ancients is a genuine native and pure Salt. It is found on the Surface of the Earth or at very small Depths within it; and is naturally

naturally form'd into thin and flat Cakes or Crufts which are of a ſpongy or cavernous Structure, very light and friable, and indeed capable of being eaſily moulder'd to Pieces between the Fingers. It is naturally, and when pure, of a pale browniſh White in Colour, but as its ſpongy Texture renders it very ſubject to be foul'd by Earth received into its Pores, it is often met with of a deep dirty Brown, and not unfrequently reddiſh.

It is apt to grow moiſt on the Surface on being expoſed to a damp Air: It is of an acrid Taſte, exactly reſembling that of the common Potaſhes or other fix'd alkaline Salts made by Fire from Vegetables, and it anſwers to all their Characters. When broken it appears more bright and clear than on the Surface, and is ſeen to be compos'd of a great Variety of Particles, the moſt regular among which are oblong and flat; theſe are its genuine and proper Cryſtals: but to ſee theſe more perfectly it is neceſſary to purify and re-cryſtallize the Salt, by diſſolving a Quantity of it in Water, filtrating the Evaporation and then evaporating the Liquor by an extreamly ſlow Heat. In Conſequence of this a thin flat Cake of the Salt will be found at the Bottom of the Veſſel, wholly reſembling the Maſſes of the native Salt, only that it is purer, as having been ſeparated from Earth and all other Foulneſſes, and of a whiter Colour and more pellucid. This Cake when broken in any Part does not fail to exhibit ſome of the Cryſtals of their proper Form, oblong, flat and truncated; but to ſee them perfectly the Aſſiſtance of a Microſcope is to be call'd in. When view'd in this manner the Surface of the Cake is found to be very rough or full of little Prominences, conſiſting of ſeveral Arrangements of long and ſlender Fibres thrown into Faſciculi and terminating in this Part, but that not regularly, but of various Heights and in various Directions. Theſe are the Cryſtals of the Salt arrang'd into little Cluſters, and terminating at different Heights. When the Maſs is broken it appears the ſame in all Reſpects with thoſe of the native Salt, except only that it is purer. The whole in both Caſes is found to be a Cluster of theſe Faſciculi, ſome larger and ſome ſmaller, only that in their Interſtices there are ſometimes ſeen ſingle Concretions: Theſe are the moſt perfect and regular of all the Cryſtals, and are what plainest of all exhibit the true Figure of the Cryſtals of the Salt: they are all oblong, flattened and made up of four Sides, two conſiderably broad, and two others very narrow, and truncated at both Ends, not form'd into Pyramids as the Tops of the Columns of the other Salts are. Theſe Cryſtals variously blending together in the greateſt Part of the Maſs ſpoil and mutilate one another's Forms, and it is of Congeries of theſe rang'd parallel to each other, that the whole Maſſes or Cakes of this Salt, whether native or cryſtalliz'd from Solution, conſiſt. In the latter Caſe they are very bright and pellucid and reſemble Cryſtal. The Natrum, whether native or purify'd, diſſolves in a very ſmall Quantity of Water; it efferveſces violently on being mix'd with any Acid weak or ſtrong, vegetable or mineral, and with Oil of Vitriol, or with a Solution of the common green Copperas will make a Salt wholly undiſtinguiſhable from the *Tartarum Vitriolatum*. Put into the Fire it readily calcines to a ſnow white Powder of a more acrid and fiery Taſte than the Salt itſelf was.

Mix'd with a Solution of Copper it inſtantly turns it to a beautiful Blue, with Syrup of Violets, it changes it Green, and with a Solution of corroſive Sublimate it gives it a yellow Colour. Reduced to Powder and mix'd with Sand or Flints,

or with any other Stone of which Cryſtal is the Baſis, it is very readily run into Glaſs, which differs in Colour and other Qualities according to the Nature of the Stone. Gold heated red hot and ſprinkled over with a ſmall Quantity of this Salt melts immediately; if there be any Impurities in the Gold they are ſeparated by means of it; but ſome Particles of the Gold itſelf are alſo apt to be detained with them, ſo that it is not to be much recommended on theſe Occaſions. Silver ignited melts in the ſame manner on ſprinkling this Salt on it, and it is on this Principle that it may be made uſeful in the ſoldering of Metals. I have had it try'd in the Place of Borax with ſome Succeſs, though not equal to that of that Salt.

Iron, Copper, and the Regulus of Antimony I have alſo try'd its Effects on, in fuſing them, and have found that it makes them melt much more eaſily than they otherwiſe would. Mercury will not be mix'd with it by any Art, and indeed will not amalgamate with Metals if only a little of this Salt be added.

It is extremely fix'd in the Fire, melting without emitting any Vapours, and changing to different Colours as the Heat is encreaſed; it firſt appears grey, then quite white, then greeniſh, and afterwards blueiſh, and finally it becomes of a reddiſh or marbl'd Colour, with Variations of purple, and bright red and fleſh Colour: Theſe Colours ariſe only from the Action of the Fire on the Salt, and it is found to grow ſtronger and ſtronger by this, the more the Heat has been encreaſed under it. Theſe are the genuine Characters of this Salt, and in all theſe it perfectly answers to the fix'd Alkalis produced from the Aſhes of Vegetables; it only differs from them in that it contains no marine Salt, which they always do till they have been purify'd from it by ſubſequent Solutions, and in that it is capable of being form'd into Cryſtals, which they are not. It is found in great Abundance in *Sindy*, a Province in the inner Parts of *Aſia*, and in many other Places in the Eaſtern Parts of the World. They ſweep it up from the Surfaces of the Earth and call it Soap Earth, uſing a Solution or Lye of it for Waſhing. It might be brought into Uſe in other Countries, and would be cheaper than the common artificial Alkali or Potaſhes, of which it would answer all the Purpoſes in the making of Glaſs and Soap.

The Natrum or Nitre of the Ancients has been by ſome ſuppoſed to be a loſt Subſtance, and by others to be the ſame with our Nitre or Salt Petre; but both theſe Opinions, though countenanced by great Names, and the latter in particular by the famous Commentator on *Pliny*, Father *Hardouin*, are equally erroneous: this Salt, different as it is from our Nitre, and common as it is in the Eaſt, is the true Natrum or Nitre of the Ancients, answering perfectly to its Deſcription, and having all its Virtues and Uſes.

The earlieſt Account we have of it is that in the Scriptures, where we find that the Salt call'd Nitre in thoſe Times would ferment with Vinegar and had an abſterſive Quality, ſo that it was uſed in Baths and in the waſhing and cleanſing Things. *Solomon* compares the ſinging Songs with a heavy Heart to the Contrariety of Vinegar and Nitre; and *Jeremiab* ſays that if the Sinner waſh himſelf with Nitre his Sin is not cleanſed off. Theſe are Properties that perfectly well agree with this Salt, but not at all with our Salt Petre. What we are further told of the Natrum by the moſt ancient Writers is, that it was of an acrid Taſte, and was found native in *Aegypt* and ſome other Places, that it eaſily grew moiſt on the Surface on being expoſed to the Air, and that being run by Fire with Sand

Sand it would make Glass. These are the original Qualities recorded of Nitre, and these agree perfectly with this Salt. *Dioscorides* has even given a Description of it which puts the Matter beyond all doubt; he says that Nitre, when in its greatest Purity and Perfection, is very light, of a lax Texture and full of Cavities like a Sponge, that it was usually white but sometimes reddish, and that it was found in Hillocks on the Surface of the Ground: whoever has seen the Salt we have been describing in this Chapter will own that these Characters perfectly agree with it. *Pliny*, who succeeded this Author, evidently means the same Substance by his Description of Nitre, nay he goes so far as to call the fix'd alkali Salt produced from the Ashes of the Oak and other Vegetables by the same Name, Nitre; and though he mentions two Species of the native Kind, one purer call'd *Halmyrbaga*, and another fouler call'd *Agrium*, yet he tells us they were so much of the Nature of the Salt procur'd from Oak-Ashes, that since they had been found in Plenty in Places whence it was easy to have them, the making the Salt from Oak-Ashes had been totally laid aside. He tells us that they made Glass with it, and from all that he says of it, it abundantly appears that it was the very same Salt we have been here describing, and that the Criticks who have wanted to alter the Text in this remarkable Passage, have only shewn that there requires something more than a Knowledge of Words to be able to comment upon the ancient Naturalists.

The *Aphronitrum* of the ancient *Greeks* was only a more lax Kind of this native Salt, it was purplish and very light and friable; but beside this they had another Substance which they call'd *Aphros Nitri*, the Spume of Nitre, which was factitious, and was a Recrement produced in the melting of Nitre.

In the Neighbourhood of *Smyrna* and *Ephesus*, and indeed through great Part of *Asia Minor*, this Salt is extremely frequent on the Surface of the Earth; they commonly find it rising into Hillocks with the loose Soil like Molehills, and they either use it in the manner of a Lixivium alone, or extract the pure Salt from the Earth it is mix'd among, and make it into Soap with Oil.

CHAPTER VII.

SAL AMMONIACUS,
Sal Ammoniac.

THE Sal Ammoniac of the Ancients was as perfectly different from the Salt we now call by that Name as their *Natrum* was from our Nitre. Theirs was a native Salt, ours a factitious one; and theirs proper for eating with their Food, whereas ours is merely for medicinal Purposes. We are told indeed of a native Sal Armoniac of the Nature of the factitious Kind now in Use among us, but the Account is erroneous. What the Authors who speak of it call Native is according to their own Accounts merely a Sublimation form'd by subterranean Fires, and the Matter produced by it is indeed somewhat of kin to the Sal Ammoniac of the Ancients, as it is a marine or muriatic Salt in a peculiar Form; but it has none of the Properties of what we call Sal Ammoniac in the Shops, and use in chemical Preparations.

In many Parts of the World where there are burning Mountains, the Crateres or Openings out of which the Flames in time of their Eruptions make their

Way, are frequently found incruſted, as well as the Stones and other Matters about them, with a white downy Subſtance, perfectly reſembling the Flores or Flowers of Salts raiſed in chemical Veſſels: this is call'd very oddly native Sal Ammoniac, by way of diſtinguiſhing it from the common Kind, which is known to be ſublim'd in chemical Veſſels. This Efflorefcence however is not of the Nature of that Salt, it has no other Taſte than that of common marine Salt, on being diſſolved in Water it re-cryſtallizes into Cubes, Parallelopipeds and Pyramids, in the ſame manner as common Salt; and theſe Cryſtals crepitate in the Fire, will turn Aqua Fortis into Aqua Regia, and have all the Characters and Qualities of common Salt, and not one of thoſe of Sal Armoniac. It is not eaſy to gueſs therefore what ſhould have induced Writers of any Degree of Accuracy to call this Salt by the Name of Sal Ammoniac, it ſeems very evidently to be only ſome Sal Gem or common foſſile Salt, which has within the Bowels of the Earth been diſſolved in Water, and in that State of Solution raiſed into Vapour with the Water by the violent Fire, till arriving at the Opening, it has there concreted into the Form of an Efflorefcence and ſpread itſelf over the Subſtances it met with moſt ready to receive it.

There have not been wanting Authors who have given the Name of native Sal Ammoniac alſo to a Salt which they tell us was form'd in the Sands of *Libya* from the Urine of Camels; but as there does not ſeem to exiſt any ſuch Salt as this at preſent, nor indeed probably ever did, otherwiſe than in the Ideas of People, who not knowing what the factitious Sal Ammoniac in Uſe among us was, had a mind to make ſome gueſs at what might be its Origin, it is not neceſſary for us to take any farther Notice of it.

After ſeparating from the true Hiſtory of Sal Armoniac the Account of Things that never exiſted, and of ſuch as though they do exiſt, are of a very different Kind from it, we ſhall give the Hiſtory of the true and native Sal Ammoniac of the Ancients, the only Subſtance of that Name indeed which has any Right to a Place here, and then give the Proceſs by which what we call Sal Ammoniac is made.

The Sal Ammoniac of the Ancients was no other than a peculiarly pure Kind of Sal Gem or foſſile Salt, proper for the preſerving and eating with our Foods. It was an extreamly pure pellucid and fine Salt, not form'd into uniform ſolid Maſſes, but finely ſtriated or compoſed of a number of parallel Fibres in the manner of our fibroſe Talcs. This is ſtill found in many Parts of the World and is by much the moſt pure and elegant of all the Kinds of foſſile Salt, and till taſted would ſcarce be ſuppoſ'd to be the ſame with the common Sal Gem. We have however abundant Proof that what we now find of this native ſtriated Salt is ſo, and as abundant Evidence from the Writings of the Ancients that what they call'd Sal Ammoniacum was alſo the ſame. We find the Titles of Chapters in ſome of them *De Ammoniaco, id eſt, de Sale of Ammoniacum*, that is of Salt: in theſe and in all the reſt of their Writings *Ammoniacum* and common Salt are declared to be the ſame Thing, only that what had this peculiar Name from the Place whence it was brought was the fineſt of all the Kinds: they deſcribe it as ſtriated, pure and well taſted, and *Dioſcorides* in particular, who was much better acquainted with the *Materia Medica* of his Days than the preſent Race of Druggiſts are with that of their own, plainly deſcribes it as a fine Kind of common Salt, the ſame in all Things, except Form, with the various Kinds of Sea-Salt

Salt and Sal Gem ; all which he had Discernment enough to see were the same Substance though differently figur'd. He tells us that this Ammoniac Salt is the best of all the Kinds, and what makes the Account much more certain yet, is that he very accurately describes and enumerates all the Virtues, Properties, and Uses of common Salt, and that in so accurate a manner that what he says can belong to no other Salt in the World ; and when he has done he tells us that the Sal Ammoniac possessed all these Qualities in a higher Degree than any other kind of Salt ; nay to ascertain what he expressly means by the Word, he tells us that it was a Salt of the Kind of that eaten with Foods, and that it was dense, pellucid and whitish, easily splitting according to the Course of its Fibres which run strait through the Masses of it. The *Arabians* tell us that it was a Kind of Rock-Salt found in the Earth in vast Masses, and that it was a very pellucid and fissile Kind of Sal Gem. It is agreed indeed that *Pliny* has a Passage which seems to describe our modern Sal Ammoniac under this Name, but this so evidently contradicts the same Author's Account in other Places where he perfectly agrees with *Dioscorides* and the *Greeks*, that there is great Reason to believe the Passage interpolated, and on a strict Examination of all the Accounts left of the Salt under this Name, to conclude that the Sal Ammoniac of the *Greeks*, *Romans*, and *Arabians* was no other than the Sal Gem under a peculiar Form.

We have this fissile or fibrous Sort of Sal Gem at this Time, brought from *Poland*, but it is not frequent there. The Ancients gave it this Name from the Ammoniac Region, or that Part of *Libya* about the Temple of *Jupiter Ammon*, from whence it was brought to them. When we read in them therefore of the Sal Ammoniac, we are always to understand that they are speaking of Sal Gem.

The Sal Ammoniac of the Moderns is absolutely a different Substance from this, a compound Salt procur'd by Sublimation from Sea-Salt, Urine, and animal Excrements.

The Scarcity of Fuel in *Egypt* has taught People to burn the Dung of Camels and other Animals, which they form into Masses with Straw, &c. and dry for that Purpose. The Soot raised from these Fires is carefully collected, and being mix'd with a little Sea-Salt dissolved in Camels Urine, is put into subliming Vessels of Glass of about a Foot and Half in Diameter. The Glasses are fill'd to two thirds of their Height, and being properly placed in a Furnace and bury'd up to the Neck in Earth, a Fire is kept up for three Days and Nights under them, at the End of which Time the Salt is found sublim'd to the upper Part of the Vessels, and they are broken to take it out. We receive it in Cakes as they are taken from the Glasses, and accordingly we meet with it in flat orbicular Masses, a little concave on one Side and convex on the other, and usually with a Lump or Prominence in the Middle. They are from five to seven or eight Inches in Diameter, and from two to four in Thickness, and have a coarse and dirty Appearance, looking Grey or Black as if ting'd with Soot. When broken they appear somewhat purer, and the Salt is found to be whitish, somewhat pellucid, and form'd of irregular Striæ or Fibres, running perpendicularly thro' the Mass. It dissolves in a small Quantity of Water, and if suffered to re-crystallize shoots into very beautiful ramose Figures. It renders the Water in which it is dissolved remarkably Cold, added to Aqua Fortis it has the same Effect

Effect as crude Sea-Salt turning it into Aqua Regia: it remains fix'd in a small Fire, but in a stronger it sublimes and will carry many naturally fix'd Substances up with it. It is upon this Principle that it is made the Basis of almost all the metalline Flores and Sublimations. It is not wonderful that it should act in many Cases in the same manner as common marine Salt, since it very evidently contains that Salt in a considerable Quantity, or at least the Acid of that Salt if without its alkaline Basis. It is indeed compos'd of this Salt and a volatile alkaline one, such as that of Urine, and may at any Time be resolved into them.

Sal Armoniac is to be chosen for medicinal Use the purest and whitest, and dryest that can be found, that which is hardest to break, and which dissolves most readily in Water.

It is best however to purify it by Solution and Evaporation of the Water if it be intended for medicinal Use. A Solution of this Salt in Water does not coagulate Milk, nor does it make any Change in a Solution of corrosive Sublimate; but on being mix'd with Oil of Tartar, or Lime-Water, it immediately exhales a very pungent Smell. Mix'd with Oil of Vitriol it makes a violent Effervescence, but instead of any Heat from this, the Liquor becomes vastly colder than before. On a chemical Analysis it yields two thirds of a volatile urinous Salt, and a moderate Share of an Acid wholly the same with that of Sea-Salt.

The crude Sal Armoniac is used in the soldering of Metals, and in the tinning of Copper and Iron Vessels, in which Case it makes the Tin adhere to the Iron. It is also used in Dying and in several other of the Arts, as among the Founders, Pin-makers, &c. In Medicine it is given in its crude State, half a Dram for a Dose as a Remedy against Agues: the common Custom is to mix some of the testaceous Powders with it, and give it just before the coming on of the Fit. It is also given by some in Pleurisies and Peripneumonies, in the same or a somewhat smaller Dose with Success. It certainly is an excellent Attenuant, and generally encreases the Discharges by Sweat and Urine: it is also used in Gargarisms in Inflammations of the Tonils and Uvula: its Solution in common Water is said to cure Corns, and with Lime-Water and a little Verdegrease it makes the fine blue Eye-Water call'd *Aqua Sapphirina*: the common Way of preparing this is by letting the Solution of this Salt in Lime-Water stand in a Brass or Copper Vessel till it acquires a blue Colour, but it would be more certain as to Proportion if a determinate Quantity of Verdegrease were thrown into it.

The greatest Quantity of the Sal Armoniac that we use at present is brought from *Egypt*, but we have also some from the *East-Indies* which differs in the Shape of the Cakes it is brought over in, these being not flat and orbicular but conic, or like Sugar-Loaves. We are not informed of the manner in which this is made, but it is exactly the same in all its Properties as the *Ægyptian*, and therefore there is great Reason to believe it is made in the same manner.

The Preparations of Sal Armoniac in Use at present are these, 1. The *Flores Salis Ammoniaci*. 2. *Sal Volatilis Salis Armoniaci*. 3. The *Spiritus Salis Armoniaci*. 4. The *Spiritus Salis Armoniaci Dulcis*, or dulcify'd Spirit of Sal Armoniac.

FLORES SALIS AMMONIACI,

Flowers of Sal Ammoniac.

This is no other than a way of purifying the common Sal Ammoniac, and rendering it more fit for internal Use than in its coarse crude State. Take of crude Sal Ammoniac and decrepitated Sea-Salt of each equal Parts: put the Mixture, ground to fine Powder, into a subliming Vessel, and raise the Flowers by a moderate Fire, they will be white and pure and may be given from ten Grains to fifteen for a Dose, in any Case in which the crude Salt is proper.

SAL VOLATILIS SALIS AMMONIACI,

Volatile Salt of Sal Ammoniac.

Take of fine Chalk two Pounds, of crude Sal Ammoniac one Pound, powder them separately, then mix them together and put them into a Retort; lute on a Receiver and raise the Fire by Degrees to a considerable Strength, for the Chalk must be calcined in some Degree before it will act upon the Sal Ammoniac, though it must not be reduced to absolute Lime, for with Lime itself no Salt can be obtained from Sal Ammoniac, in a solid Form. The volatile Salt will adhere to the upper Part of the Vessel, and is to be separated for Use.

This is the Salt commonly used in Smelling-Bottles. Its Smell is of the most pungent Kind, and it is therefore good to be held to the Nose in Faintings, Vertigoes, Lethargies and Apoplexies: internally it is a Diaphoretic and Cordial, and promotes the Circulation and opens Obstructions: its Dose is from three to eight or ten Grains.

SPIRITUS SALIS AMMONIACI,

Spirit of Sal Ammoniac.

Take of Salt of Tartar, or purify'd Potashes a Pound and a Half; of crude Sal Ammoniac a Pound; of Water two Quarts; put the Mixture into a Retort, and distil off with a gentle Fire one Quart. This is the Recipe in the late *London Dispensatory*. A more acrid and pungent Spirit may be procur'd from Sal Ammoniac by distilling it with Lime, but this is much fitter for internal Use. The Virtues of it are the same with those of the Salt: its Dose is from fifteen to twenty-five or thirty Drops.

SPIRITUS SALIS AMMONIACI DULCIS,

Dulcify'd Spirit of Sal Ammoniac.

Take of any fix'd alkaline Salt, as that of Tartar or purify'd Potashes, half a Pound; of Sal Ammoniac four Ounces; of Proof Spirit three Pints; put the whole into a Retort and distil off a Pint and a Half by a gentle Fire. This is the famous *Spiritus Volatilis*, call'd *Sal Volatile Oleosum*, but without the Aromatics. The Spirit known by that Name is readily made from this, by adding to a Quart of it, Essence of Lemons and essential Oil of Nutmegs, of each two Drams; essential Oil of Cloves half a Dram, and distilling it over again with a gentle Heat.

Beside these Preparations of Sal Ammoniac we are not to omit to mention under this Head, that the Flowers of Iron, Copper, and those from the Hæmatites and other Oars, and Vitriols of the Metals, owe their Form in a great Measure to this Salt. These are described at large under the Heads of the several Metals they belong to. Many artificial Sal Ammoniaks are also made by the Chemists for the raising the Metals in Form of Flowers: these are all prepared upon the same Basis as the common Sal Ammoniac, being made from the

volatile

volatile Salt of Urine mixed with the Acids more peculiarly appropriated to the Solution of the Metals to be worked upon. Some of these are made with the Acid of Nitre, some with that of Vitriol, and some only with that of Vinegar. They have also a great Opinion of a Power in Sal Ammoniac of drawing out the Sulphurs and the Mercuries of Metals, and it is hence that they have called it the *Clavis Metallorum*, *Sal Mercurialis Philosophorum*, *Sal Mirabilis*, *Sal Solaris*, *Aqua Cælestis*, and by a hundred other fantastical Names.

It has been pretended by many that the crude Sal Ammoniac is an Alkali, because it raises a violent Fermentation with Oil of Vitriol, but we are not to trust to Appearances; the strictest Enquiry into the Nature of this Salt proves it to be merely neutral, neither acid nor alkaline in any Degree. 'Tho' the vitriolic Acid raises an Effervescence with it, the stronger Acid of Nitre does not stir at all with it, nor does that of Sea-Salt or any of the vegetable Acids. A Solution of it is not so much as made turbid by any of these Acids, a fixed Alkali added to the Solution of this Salt produces no Fermentation in it, though it makes it emit a very pungent Smell; it is evident from these, and a Multitude of other Experiments, that Sal Ammoniac is in Reality neither acid nor alkaline: all the Commotion that is raised on mixing with it the Acid of Vitriol, is owing to the peculiar Action of the vitriolic Acid which renders that of the Sea Salt volatile.

Sal Ammoniac with Quick-Lime affords a fiery and pungent Spirit, like that procured from recent inspissated Urine; this is not alkaline though so extremely acrimonious. On the other Hand when this Salt is distilled with a fixed Alkali, it affords a pungent Spirit approaching to the Nature of the former, but less acrimonious and truly alkaline, and effervescing very violently and with Heat on being mixed with any Acid; though only a cold Fermentation can be produced in the mixing the appropriated Acid, which is Oil of Vitriol, with the crude Salt. The very Fumes of this Spirit will ferment violently with those of an Acid; and if a Vial of it be left unstopped near another open Vial of the strong Spirit of Nitre, there immediately rises a violent Effervescence in the Air, from the meeting of the Fumes of the two Liquors in it. If three Parts of Sal Armoniac be mixed with one Part of pure Salt of Tartar, there immediately arises from the Mixture a sharp and pungent Vapour; and if this Mixture be put into a Retort, and the volatile Salt sublimed, there remains at the Bottom a Salt that will not rise in the strongest Fire, and this dissolved in Water and crystallized assumes the Form and Characters of common Salt. Its Crystals are of a cubic Figure, and it crackles in the Fire, and if added to Aqua Fortis turns it into Aqua Regia.

From this Salt the famous febrifuge Salt of *Sylvius* is made, only by calcining it for some Time in a Crucible, and afterwards dissolving it in Water, and reducing it to a dry State again by Evaporation, a pure white Salt is thus obtained, which *Sylvius* recommends to be taken a Dram for a Dose, two Hours before the Time of an Ague Fit, and assures us that he had cured great Numbers by it.

FOSSILE BODIES

Used in MEDICINE.

CLASS the FOURTH.

Metalline SALTS or VITRIOLS.

THE Vitriols are compound Bodies, form'd of the Particles of Metals, dissolved by the Acid of Sulphur, and that either by the Operations of Nature within the Earth, or in the Chemists Laboratory by proper Admixtures and Assistances, and afterwards by the Help of Water brought into the Form of a Salt.

The Vitriols therefore very much approach to the Nature of Metals, and in some Instances are found to have taken up other Substances, particularly some of the Semi-metals among them, as particularly the white Vitriol which contains Zink. The only Metals that we find dissolved in this manner in the Bowels of the Earth, and there form'd into Vitriols, are Iron and Copper. These therefore are the great Bases of these Salts, and according as they belong to one or the other of them, they are to be divided into the cupreous and the ferrugineous Vitriols.

The Naturalist who collects for his Amusement will meet with Vitriols containing these two Metals, in various Proportions in the same Mass: the blue green Vitriol of *Hungary* and *Transylvania*, and many other of the Fossiles of this Class are of that Kind.

We have here only to do with Bodies fit for the Uses of Medicine, and are therefore to treat only of those distinct and determinate Vitriols which contain only the Particles of one of these Metals. Of these there are but three Kinds, distinguishable according to their Colours, into

1. GREEN VITRIOL. 2. WHITE VITRIOL. 3. BLUE VITRIOL.

To these we are however to subjoin the vitriolic Minerals, Misy, Sory, Melantina, &c. which are all of them properly the Ores of Vitriols.

CHAPTER I.

VITRIOLUM VIRESCENS,
Green Vitriol.

THIS Species of Vitriol has Iron wholly for its Basis. It is form'd solely of that Metal, dissolved by the Acid of Sulphur, and by means of Water reduced to the Form of a Salt. It is of two Kinds, Natural and Factitious, the
S natural

natural or native Kind is known by the Name of green Vitriol ; the common Appellation of the other is Copperas.

It is a tolerably pure and pellucid Salt, of a compact and regular Texture, considerably heavy, but friable, and easily shattering to Pieces on the smallest Blow. It is of a fine pale grass-green Colour. It will not melt, or wholly run to Water in a damp Air, but it is very apt to be moist on the Surface ; it very readily dissolves in Water, and after Evaporation freely shoots again into regular Chrystals, the true Figure of which is a thick Rhomboid ; but they are seldom perfect or regular. Exposed to the Fire it becomes thin like Water boiling and bubbling up, and emitting a very thick Fume. After this it grows thicker, and finally calcines to a grey Powder ; and from this, if the Fire be continued and made more violent, to a fine purple Matter call'd *Colcothar* of Vitriol.

A Solution of this Vitriol will curdle Milk. It gives a greenish Colour to Syrup of Violets. It makes no Change in a Solution of corrosive Sublimate ; with Lime-Water or a Solution of Salt of Tartar it becomes of a dusky yellowish Colour ; and with a Decoction of Galls, which is the readiest of all Tests for it, it becomes Ink. It is to be chosen in large Pieces dry, clear, and transparent, of a fine green Colour, and with none of that earthy Matter among it, which is too frequent in the larger Parcels of it.

The native green Vitriol is found often in irregularly shap'd Masses from an Ounce or two to a Pound or more in Weight, among the Ore in the Mines where there is Iron : These Masses are frequently covered over with irregular Prominencies, sometimes with regularly figur'd Crystals of a rhomboidal Form on their Surfaces. Frequently also it is found hanging down from the Roofs and along the Sides of Caverns, in Form of Icicles, perfectly resembling those of sparry Matter, which our *Derbyshire* Mines abound with, and which are commonly known by the Name of *Stalactites*. This is called Stalactical Vitriol. There are of these from the Thickness of a Straw to three or four Inches in Diameter, and from an Inch to two Feet in Length. They are generally formed pretty regularly tapering, from the Base to the opposite End ; but they are not smooth or equal on the Surface, but usually full of roundish Protuberances, they appear transparent if held up to the Light, and when broken shew an even and glossy Surface.

Native Vitriol of both these Forms is frequent in the Mines of *Gosselaer* in *Saxony*, in those of *Bohemia*, and in several of those of the *Hart's* Forest in *Germany*.

The factitious green Vitriol, which we usually call Copperas, is in all Respects the same with the Native, except in its Form and Manner of Production.

The Vitriol in the Masses of fossile Matter from which this is separated is truly in the State of Ore, it does not appear to the Eye, but it is more or less discoverable by the Taste.

The several Kinds of Vitriol-Ores in this Sense of the Term are very different from one another, and are very numerous. The most frequent and one of the richest in Vitriol is the common Pyrites of our Clay-Pits. This is a Body which assumes various Forms in its several Masses, but is always of a dusky greenish Colour, and where it has not been determined in its Shape by some animal or vegetable Mould is usually flattish, and is seldom found in ve-

ry large Masses. It is extremely frequent in all our Clay-Pits about *London*, in which Places we meet with it also in a Multitude of other various Forms, it sometimes having been cast in Shells of Sea-Fish, especially of the *Buccinum*, *Nautilus* and *Concha Anomia* Kind, and very frequently in the Form of Wood whose Pores it has entered, and lodged itself in the same Manner as in the Particles of Stone in the ordinary petrified Wood. Among the various Pieces of Wood it meets with in these Strata, some of which appear to have been Fragments of the Bodies of Trees, others of the smaller Branches, it not unfrequently has lodged it among such Masses as have before been eaten by Sea-Worms, and have formed the Syringoides. These Species when petrify'd in the common Way make what is called the *Lapis Syringoides*; in this State they are called the Pyrites Syringoides; in all these and the thousand other Shapes in which this Pyrites offers itself to our View, it is itself the same Substance in every Respect. It is hard, compact, and firm as it lies in the Earth, tho' it grows very soon friable and shattery on being exposed to the Air. It is covered with no Coat or Crust, but shows its own natural Surface; and when broken it appears of a simple uniform Structure, and of the same Colour within as at the Surface. If struck against a Piece of Steel it gives Fire very freely, and the Sparks are large and very bright. It will not ferment with any Acid, and when try'd by Fire, it cracks, and bursts, and burns with a fine blue Flame and a strong Smell of Sulphur, finally calcining to a fine deep red Colour.

Beside this Species of the Pyrites, which is the most frequent, the most rich in Vitriol, and the most usually worked for it, all the other Pyritæ and all the Marcasites without one Exception contain it. There are several stony Substances also very highly impregnated with it, of which, in *Germany* particularly, they meet with some which are of a reddish Hue, as if they had been naturally calcined in the Earth; others of a fine bright golden yellow, from the Quantity of the yellow Mundic contained in them; others of a dusky grey, and others of a deep black. The Ores of Metals also frequently contain large Quantities of the Ore of this Vitriol among them, and even the last mentioned Kinds of genuine Ores of the Vitriol not unfrequently contain also Particles of the Metals among them. The mundic or common Marcasite of *Cornwall* is of this Number, containing frequently metalline Matter in it, and always Vitriol and Sulphur.

The Pyritæ that afford this Vitriol always contain Iron and Sulphur in them, and not unfrequently also Copper, and sometimes Arsenic: When they contain only Iron, they generally crack and shoot out their Salt very quickly and easily on being exposed to the Air; those which contain Copper, especially if there is Arsenic among the Mass, do not break so soon, but often will stand the Effects of the Air ever so long, and require to be calcined and wetted before they will shoot or give any Token of the Salt they contain, though they have it in great Abundance.

A Multitude of other Substances also contain this green Vitriol, which one would hardly suspect of it; among these we may mention the brown Iron-Ore of the *Gosselaer* Mines, the reddish ferrugineous Stones found over the Strata of Coal on *Mendip* Hills, and in some other Parts of *England*, and the common Calamine. All Calamine contains some of this green Vitriol; but from the naturally red Pieces I have separated it in a very large Proportion, and in

the cavernous Hollows of some of its Masses sent from the *German* Mines, I have also seen small Masses of the native white Vitriol, which is the less wonderful indeed, as Zink, which is the metalline Matter contained in Calamine, is the very Substance which gives the Vitriol of Iron its white Colour.

The Calamines are all of the Number of those Ores which will not shoot on being merely exposed to the Air; it must be previously roasted and sprinkled at Times with Water.

The Ores of Alum also frequently contain Vitriol, and the Alum is less easily separable from these, than from such as contain only that Salt. Hence arises the Account we meet with among People less informed of these Things, of Stones and Earths very strongly tasting of Alum, but from which no Alum can be obtained. The Business is, that in working them for their Salt the Vitriol shoots first, as the common Salt mixed with Nitre does in the purifying that Salt; but if these People, after the Vitriol is shot, would throw some Alkali into the remaining Liquor, they would soon find their Alum. The common *Irish* Slate, and many other of the fossile Alum-Ores contain Vitriol in Abundance.

The *Germans* make green Vitriol from any of the Ores we have been mentioning, by burning them and afterwards exposing them to the Air; and in some Places they first of all melt the Sulphur from them, and then work them for their Vitriol.

In *England*, where the greatest Quantity of this Vitriol is made, of any where in the World, it is all made from the common greenish Pyrites above described with the Addition of old Iron. The People who collect this Pyrites are not at the Pains of searching it among the Strata, but they pick it up on the Sea Coasts of *Essex*, and other Places, under Cliffs composed of Strata of Clay, out of which the Sea washes it and leaves it on the Shore. This Pyrites they expose to the Air in vast Heaps, and in Consequence of that it by Degrees begins to swell and burst, and shoot out its Salts. They pile up these Heaps in a Kind of Pits lined with Clay, now and then turning them when their Salt begins to appear in a downy Efflorescence on the Surfaces of the Pieces they fall into, on breaking; the Time of making the Vitriol being near. These Efflorescences dissolve by the Rains and Dews, and are in fine converted into an acrid Liquor, which is conveyed from the Bottom of the Pits into leaden Boilers, into which a Quantity of old Iron is also thrown; the Fire is made under these and the Liquor kept boiling for three Days or more, and is all the Time supplied with fresh Parcels of Iron so long as it will act upon them. The old Iron pick'd up by the poor People about our Streets is sold to the Vitriol or Copperas Makers with this Intent. When the Liquor is boiled to a proper Consistence, it is let out into large Coolers, in which there are Sticks placed across, to which as well as to the Sides of the Vessel the Vitriol adheres in large Crystals, of the Form and Texture above described.

This Salt on a chemical Analysis affords a very strong acid Spirit, or as it is usually though very improperly called Oil, which is a Solvent for many of the Metals, and effervesces very violently with any Alkali, and even with Spirit of Wine or common Water. Mixed with Sal Armoniac it ferments violently, but the Fermentation is attended with a great Coldness instead of the Heat

Heat usual on these Occasions; and what is very singular is, that while the fermenting Mixture itself is thus cold, the Vapour that arises from it is evidently hot to the Hand. After the Distillation of this acid Liquor of Vitriol, what remains in the Retort is a red Earth called *Colcothar*; it contains Iron, and is a strong Astringent.

Nothing is more evident than that this Vitriol is Iron dissolved by an Acid and reduced to the Form of a Salt by Water. For if the Acid of Sulphur be added to Water and Filings of Iron thrown into the Liquor, the Iron will be dissolved; and on evaporating the Water to a Pellicle, Crystals will be form'd about the Sides of the Vessel, wholly the same with the green common Copperas.

The *Greeks* who speak of Vitriol in very general Terms, and do not well distinguish that of Copper from that of Iron, call it *Chalcanthum*, a Name strictly signifying an Efflorescence of Copper; whence we should be led to imagine that the Vitriol of Copper, or the blue Kind, was what they had most in Use. The *Italians* also call it *Cuperosa*, as if to express a Salt produced by an Erosion of Copper. This would be very properly applied to the blue Vitriols, but very badly to those of Iron, though our *English* Word Copperas seems derived from it.

The oldest *Greek* Writers seem as well as we to have been acquainted with the two Kinds, the native and factitious Vitriol. They call the former, from their usually finding it in long Masses like Icicles, as we do at this Day, hanging from the Roofs of Caverns in their Mines, Stalactical Vitriol. The factitious Vitriol, which they call *Pestum* and *Ephtum*, they obtained by boiling some of the vitriolic Ores in Water, and evaporating that Liquor for the Crystallization of the Salt; but they had no Knowledge of our Way of obtaining it from the fermented and destroyed Pyrites.

The Uses of the green Copperas are very numerous, it makes, with an Infusion of Galls and a little Gum-Arabic, the common writing Ink. It stains Leather black, and thence has obtained its Name of *Atramentum Sutorium*. It is also the great Ingredient in dying Cloaths, Hats, and the like black. In Medicine it is rarely prescribed under its Name of Copperas or green Vitriol, but it is a true Salt of Iron, and is often prescribed under that Name, and used instead of the genuine Preparation; our Chemists in general, giving themselves no farther Trouble about the making that Salt than to dissolve and purify the common Copperas, and shoot it again into Crystals. It is a noble Deobstruent, and is one of the greatest Medicines in the World in Suppressions of the Menfes, but it must be used with Caution. In large Doses it proves emetic, and in smaller is found a good Medicine also against Worms.

The Preparations of green Vitriol in Use in the Shops are, 1. The strong acid Spirit or Oil of Vitriol. 2. The *Colcothar* of Vitriol, or calcined Vitriol. 3. The *Tartarum Vitriolatum*. 4. The *Spiritus Vitrioli Dulcis*. 5. The common *Spiritus Vitrioli*, or weak Spirit of Vitriol.

SPIRITUS VITRIOLI,
The acid Spirit of Vitriol.

This acid Spirit is of two Kinds, that is of two Degrees of Strength, and is accordingly known by two Names; the weaker being called the Spirit, and the stronger, tho' very improperly, the Oil of Vitriol. The Preparation is this.

Take

134 The ACID SPIRIT of VITRIOL.

Take a Quantity of common green Copperas, put it into an unglazed earthen Vessel covered with a Tile; place this Vessel on a Hearth, and make a Charcoal Fire all round it. The Vitriol will first begin to fume, and will afterwards melt; and finally on encreasing the Fire, it will become a solid grey Mass, which in a little longer Time will become yellow, and in fine will begin to appear reddish about the Edges; then take the Vessel out of the Fire, break it, and powder the yellow Mass. This is calcined Vitriol, and is ready for Distillation, its aqueous Part being now driven off.

Eight Pounds of green Vitriol will yield five Pounds of this calcined Matter. This is to be put into one of those earthen Pots which the Chemists call long Necks, this must be chosen a very strong one, and must be large enough to hold double the Quantity of Matter that is to be put into it. An Adaptor is to be applied to the Mouth of the long Neck, and well luted on with *Windsor* Loam; and a very large glass Receiver is then to be fitted on to the Adaptor, so as to receive about two Inches of its farther End into it. This Receiver is to rest horizontally on a Bench in an even Line, with the Adaptor and the Vessel that contains the Vitriol. This is to be luted on to the Adaptor as that was to the long Neck, and the whole Joint to be covered with linen Rags spread over with the same Lute made a little thinner. The Vessels are to stand thus four and twenty Hours for the Lute to dry. At the End of this Time make a Fire under the long Neck, let it be so moderate at first as only to send over a white Fume into the Receiver and warm it. This Degree of Fire is to be continued six Hours; after this, encrease it till oily Veins are seen running down the Receiver; let it be kept in this State six Hours more; and finally raise it to its utmost Height, that the long Neck may be thoroughly red hot; keep it thus six Hours, and the strong Spirit or Oil will all come over. If the Fire be continued longer, a little more of the Oil will rise, but not enough to pay for the Fuel and Trouble. Let the Fire go out, and when the Receiver is cold unlute the Vessels, and pour the Spirit through a glass Funnel under a Chimney into a Bottle for Use. This is the black thick Oil of Vitriol: It is proper in this State for many chemical Purposes; but for Use in Medicine, it is to be rectify'd by distilling in a glass Retort and Receiver in a Sand Heat. There will by this Means be drawn over a Spirit of Vitriol known by the Name of *Spiritus Vitrioli* in the Shops, and the Oil, as it is called, or strong Spirit will remain in the Retort heavier and stronger than before though clear.

A careful Operation will afford one and twenty Ounces of the first Liquor from eight Pounds of Vitriol.

The strong Spirit or Oil of Vitriol will not be made to boil over the Fire by a less Degree of Heat than that of six hundred Degrees, Water boiling with a Degree of a little more than two hundred. It very readily dissolves Iron, Copper, and Zink. And when the first of these is in Solution, a copious Vapour is sent up of a very disagreeable Smell, and so very inflammable, that if a Candle be brought near it, it takes Fire and bursts the Vessel. Gold is almost entirely free from the Action of this Acid. Silver, Tin, Mercury and Lead are rather corroded than dissolved by it, though some Part of them is so well taken up by it, that it will pass the filter with it. In Medicine it is given internally in Fevers and Hæmorrhages, and particularly in malignant

malignant Fevers of the petechial Kind ; where the Texture of the Blood is broke the Use of Spirit of Vitriol, given in all the Drink in such Quantity as to give an agreeable Acidity to it, is of the greatest Benefit.

COLCOTHAR VITRIOLI,
Colcothar of Vitriol.

Vitriol any Way calcined to a Redness is called *Colcothar*. It may be reduced to this State by continuing the Calcination prescribed as a previous Circumstance to the Distillation of it, till it acquires this Colour. But what remains in the long Neck after the Distillation of the Spirit is so much better calcined than any Body will be at the Pains of doing it any other Way, that it is usually preferred, and is the Substance kept under this Name in the Shops.

The College Dispensatory orders the Vitriol to be kept for certain Uses also, as calcined to a Yellowness not to this red Colour. A Quantity of this calcined Vitriol may be saved from the Mass calcined for Distillation to save the Trouble of a particular Process.

TARTARUM VITRIOLATUM,
Vitriolated Tartar.

Take any Quantity of the strong Spirit called the Oil of Vitriol, add to it three times its Weight of pure Water made a little warm : Let the Mixture be made in a tall and capacious glass Vessel with a narrow Neck ; drop into this Liquor Oil of Tartar *per Deliquium*, till the Acid is perfectly saturated. The hitting nicely the Point of Saturation is the great Difficulty in this Process ; for if there be a Predominance either of the Acid or the Alkali, there will be an Acrimony very improper to be in the Salt. A violent Effervescence arises in making this Mixture, and before the Saturation is perfected a white Salt begins to precipitate.

To know when the Point of Saturation is truly hit, when it is supposed to be nearly so, take out a small Quantity of the Liquor, and if the Taste does not discover a Predominancy either of the Acid or the Alkali, divide this Quantity after warming it into two Parts ; and into the one drop Oil of Vitriol, into the other Oil of Tartar ; if no Effervescence rises from either of these Experiments, the Saturation is perfect. Add then to it as much warm Water as is necessary to dissolve the Salt that has formed itself in it, and filtrate the Liquor ; then evaporate and crystallize it, and a fine white Salt of the neutral Kind will be obtained.

There is a Method of obtaining the vitriolic Acid in sufficient Quantity for this Preparation without the Assistance of Fire, and *Tachenius*, who imagined that the Oil of Vitriol, as it had been raised from that Salt by so great a Force of Fire, might have carried some metallick Particles up with it, recommends highly the making the *Tartarum Vitriolatum* from a mere simple Solution of green Vitriol and Salt of Tartar. The late Colleg Dispensatory also gives the Recipe in this latter Way. The Process by which it is ordered to be made is this.

Dissolve eight Ounces of green Vitriol, or common Copperas, in two Quarts of Water by boiling them together ; when this Solution is perfectly made throw in a small Quantity of Salt of Tartar, or of any other fix'd alkaline Salt ; let the Liquor boil up again, and when the Fermentation occasion'd by the Addition of this Quantity of the Salt is over, add more and let it boil again

again, continue to do this till there is no Fermentation on mixing more of the Alkali. This is usually found to be the Case, when about half as much of this is used as there is of the Vitriol: the Point of Saturation is yet more exactly to be known by dropping in a few Drops of Oil of Vitriol; for if there is no Effervescence raised by this, the Alkali is known not to exceed, as certainly as it was known that the Acid did not, by there arising no further Effervescence on fresh Additions of the Alkali to the Liquor. In this State filter the Liquor through Paper, and evaporate it to a Pellicle and set it to crystallize. The Salt form'd by this Process is very little different from that made by the other, when that has been truly and carefully perform'd.

This is a very valuable Medicine. It attenuates, resists Putrefaction and stimulates and opens the obstructed Viscera. It is best given on an empty Stomach, and diluted afterwards with Whey; and in chronic Cases Exercise ought to be used with it.

SPIRITUS VITRIOLI DULCIS,
Sweet Spirit of Vitriol.

Take of the strong Spirit or Oil of Vitriol one Pound; of rectify'd Spirit of Wine one Pint; mix them very carefully by Degrees, putting the Spirit of Wine first into the Vessel, and adding the vitriolic Acid by a very little at a Time: distil the Mixture in a Cucurbit, with a very gentle Heat, till a black Froth begins to arise, then let all cool and pour the Spirit, found in the Receiver, into a Bottle with a good Stopper to it.

C H A P T E R II.

VITRIOLUM ALBESCENS,
White Vitriol.

THIS is a true and genuine though not a pure Vitriol of Iron, and its Colour, which has so long perplexed the World to account for, is at length found to be owing to a Mixture of Zink in it. It is a soft and friable Substance of a pure white Colour, not transparent, nor form'd into regular Crystals, but resembling Lumps of fine Loaf Sugar: We meet with in the Shops, in Form of large and usually flat Masses, of twenty, thirty, forty, or more pounds Weight. It is of a nauseous and styptic Taste, considerably heavy, and is apt to contract a Moisture on its Surface when exposed to the Air, and at length to change Colour, acquiring a ferrugineous Tinge, that often penetrates into it. It very readily dissolves in Water, and concretes again after Evaporation into the same white and brittle Masses. Exposed to the Fire it burns at length to the same purple Powder, or *Colcothar*, that the green does.

White Vitriol is to be chosen the hardest, firmest and dryest that can be had, and that which is of the whitest Colour, and most perfectly resembles fine white Loaf Sugar. It has all the Effects of the green Vitriol in Mixture with Alkaline and other Solutions, and with an Infusion of Galls makes a better Ink than that: a much smaller Quantity of it than is usually employed of the other gives a deeper black than any Proportion of that can, and the Ink is not so apt to lose its Colour and turn red on the Paper, as that in which the Colour is owing to the green.

The white Vitriol which we use in the Shops is all of it prepared from the native Salt of the same Name and Colour by Solution and Evaporation. It has been an Opinion of many of the Writers on these Subjects, that it was only a green Vitriol calcined by Art ; but this is so very erroneous an one, that it is not only impossible to make such a white Vitriol as we use that Way, but all the Power of Art is not able to form any Counterfeit for it that shall tolerably resemble it.

It is truly a native Salt, and is found in Mines of Iron and Lead, and sometimes in those of other Metals. It appears sometimes in Form of a fine downy Efflorescence on the Roofs and Sides of Mines, sometimes in small Masses in Form of thin and flat Crufts, which are sometimes of a roundish Figure, sometimes perfectly irregular at the Edges. These are moderately hard, of a white Colour, sometimes with a faint Tinge of Red, and are somewhat pellucid. In other Places it is met with in larger and irregular Masses of a very lax and friable Texture, and of a brownish or yellowish White. Its most perfect and beautiful Form however is in fine and large Icicles of a pure white, perfectly resembling the common sparry Stalactites, or those of green Vitriol in Figure. In these it is usually whiter than in any other State ; though sometimes it is tinged even in these with a Cast of reddish, but it is very apt to grow damp on the Surface. These are found from an Inch or two in Length to such as weigh many Pounds, and are as long and thick as a Man's Arm.

The Miners sweep off the Efflorescences from the Roofs and Walls of the Caverns, and picking off the other Masses, they throw them and these Stalactites together into Water, where they all dissolve together ; and after the Solution has been two or three Times strained through Flannel, they evaporate it, and procure the white Vitriol as we see it in the Shops.

It has a great while puzzled the Enquirers into the Nature of these Bodies, to know to what it was that this Vitriol which appeared plainly a Vitriol of Iron in all its Qualities owed its Colour. Some supposed it contained Lead, others Tin, and others a native white Earth. Some indeed have come very near the Matter, affirming that it contained Calamine. The Truth is, that it does contain Zink, of which Calamine is the Ore : it owes its Whiteness to this Semi-metal, and pure Zink may be at any time separated from it, by any one who knows the necessary Precautions of the adding a Phlogiston, and working in close Vessels, when that Substance is to be procured.

The greatest Quantity of white Vitriol in the World is produced in the Mines of *Gosselaer* in *Saxony*, and in those of *Craunitz* in *Hungary*. There is some of it in *Sweden* also, and a great Deal in the *East-Indies*, where we know also that there is Zink in Abundance, as there is in all Places where this Salt is found.

White Vitriol is a safe, gentle, and very expeditious Vomit. It may be given in Solution from ten Grains to a Scruple or more. It is also used externally in Collyriums, intended against Inflammations of the Eyes, and is a very powerful Styptic in Injections to stop the Gleet that sometimes remains after the Cure of a Gonorrhœa.

The only Preparation of this Vitriol in Use in the Shops is the *Gilla* or *Sal Vitrioli*, which is merely a Purification of it by Solution either alone, or with the Mixture of a small Quantity of Acid. The College Dispensatory has ordered it thus.

T

Take

Take white Vitriol a Pound, strong Spirit or Oil of Vitriol one Ounce, fair Water two Quarts; dissolve the Vitriol by boiling in the Water with the Acid mixed in it, and filter it; then evaporate it to a Pellicle; and on setting it in a cool Place the Salt will shoot. The Acid here is of great Assistance to the Salt in forming itself.

AQUA VITRIOLICA CAMPHORATA,
Camphorated Vitriolic Water.

Take white Vitriol half an Ounce, Camphire two Drams; grind them together to a coarse Powder, and then pour on them a Quart of boiling Water; let it stand three or four Hours, and then filter it off for Use.

It is much recommended as a Collyrium in inflammatory Disorders of the Eyes.

CHAPTER III.

VITRIOLUM CÆRULEUM,
Blue Vitriol.

THIS is a Vitriol which has Copper for its Basis, as the former two have Iron; and this Metal has in the same Manner been dissolved by the Acid of Sulphur and Water in this, as the Iron has in those. It is the most elegant and beautiful of all the Vitriols. We meet with it always in its perfect and precise Form, in regular Crystals of a rhomboidal Figure, and composed of ten Planes; they are thin or flat in Proportion to their Size, and are of a beautiful blue Colour, perfectly transparent, and emulating the Appearance of Sapphire. These are considerably harder than the Crystals of any other of the Vitriols, and are not apt to contract Moisture on lying exposed to the Air, though if left carelessly exposed to Damps for a long Time, they will be at length rendered greyish on the Surface.

This is extremely different in its native State from the other Vitriols, they are found native in their solid State, but this never. It is only met with suspended in the Water of certain Springs from which it is reduced by Art, by means of Evaporation and Crystallization, to the State in which we see it. In the Hills of many Parts of the *East-Indies*, and in many other Parts of the World where there is Copper, and about the Mines of *Germany* where there is also Plenty of the Ore of that Metal, there are found frequently trickling down small Streams of a blueish Water, of a very acrid and austere Taste. This Water has in its Course through the Strata, washed over some Place where there is Copper in Abundance acted upon by the native sulphureous Acid, and as in that State the Metal is capable of Solution in Water it has dissolved and taken it up in its Passage, and comes out fraught with it, and ready on Evaporation to shew it in the Form of Vitriol. If a Piece of Iron be dipped but for a few Moments in these Springs, it is crufted over with a thin Coat of Copper, and if left longer in them, the Iron is wholly dissolved and carried off, and Copper is precipitated in its Place.

It is indeed found in the very Form and Lineaments that the Iron had, and hence arises the vulgar Opinion of these Waters which are called Cement or Ziment Springs turning Iron into Copper. The Water of those Springs of this Kind which are found strongly enough impregnated with Copper to be worth the working

working for Vitriol, is sav'd in Reservoirs and evaporated to a proper Standard, after which it is let out into Coolers where it shoots into the regular and beautiful Crystals we see. These Crystals have the same Qualities with the Water, and on Solution in common Water they make a Cement or Ziment Liquor, undistinguishable from the native Kind. If only wetted and rubbed on the Blade of a Knife, they also give it a Copper Colour, or precipitate a thin Coat of Copper upon it.

There are many who pretend to have seen blue Vitriol native and in its proper Form; but they have deceived themselves. There are indeed sometimes found Crystals of blue Vitriol on the Stones that lie about the Edges of the Springs where the Cement Waters issue out of the Earth; but these are only Crystals form'd by the Evaporation of that Water by the Sun's Heat, as the common ones are by Fire; so that they are no native Vitriol. What People say of having found this Vitriol in large Masses in Mines, is also to be explained into an Error; they have mistaken for it the common blue green *German* Vitriol which contains Iron and Copper mixed, and the Iron always in much the largest Quantity; it would therefore be a very great Error to suppose this the same with the true cupreous blue Vitriol, or to use it in its Place.

Blue Vitriol is indeed contained in the Sory or Rufma, in imperceptible Particles in the Form of Metals in their Ores. This indeed, as also the Misy, Chalcitis, and Melanteria, are all truly and properly Ores of Vitriols, and would have been described as such, but that the Custom of the World renders it necessary to us to treat of them separately under their several peculiar Names. Many of the Pyritæ and Marcasites or Mundics contain also blue Vitriol, but seldom pure; there being usually in these an over Proportion of Iron. There are also some Earths said to contain it, but they principally owe it to the Ziment Waters passing through them, and leaving some of its vitriolic Particles behind it.

Blue cupreous Vitriol is not given internally, but it is of great Use in external Applications, and there are several Preparations of it recommended in Dispensatories; one of the most valuable of these seems to be the *Aqua Vitriolica Cærulea* of our late College Dispensatory.

AQUA VITRIOLICA CÆRULEA,
Blue Vitriolic Water.

Take blue Vitriol three Ounces, Alum and strong Spirit or Oil of Vitriol, of each two Ounces, Water a Pint and half; dissolve the Salts in the Water by boiling, and then add the Acid, finally filter the whole through Paper for Use.

This is an excellent Styptic, and particularly serviceable in Hæmorrhages of the Nose.

O F

VITRIOLIC MINERALS.

BY the Term Vitriolic Minerals we would be understood to express compound fossile Substances, form'd of various stony and earthy Particles; but always containing among these, Particles of either Iron, or Copper separately, or of both conjunctly; and these always dissolved by the Action of the Acid of Sulphur and Water, and reduced to the State of Vitriols, though in such small Concretions, as not to be distinguishable by the Eye, but easily perceived by the Taste. According to this Definition, vitriolic Minerals are properly and truly Ores of Vitriol; but they have so long been received under their several peculiar Names that it will be expected of us here to treat of them as distinct and separate Fossils.

Of these vitriolic Minerals, we have four in the Catalogue of Simples, 1. The Chalcitis. 2. The Misy. 3. The Sory or Rufma, and 4. The Melanteria.

CHALCITIS.

It is much to the Scandal of the present Age, that this Mineral, though its Name is retained in all the Catalogues of the *Materia Medica*, and even stands among the List of Ingredients in some of the capital Compositions of the Shops, yet is known only by Name among us. No body has ever met with it in the *English* Shops, nor is indeed its very Nature understood there. Most People give it up as one of the lost Fossils of the Ancients; and the few who are of another Opinion, take it to be a pure native Vitriol of a red Colour.

It is properly a mixed Ore of the cupreous and ferrugineous Vitriols, and though so perfectly unknown among us, is now very frequent and in common Use in Parts of the World nearer the Places where the Ancients lived, who have left us so many Praises of it.

Chalcitis is an opaque Mineral, considerably heavy, of a soft and friable Texture, and of a very irregular and rude Structure. It is found usually among the Ores of Iron and Copper, but sometimes in Strata of mere Earth, and is usually met with in Masses of about half a Pound or a Pound Weight, though there are some of twenty times that Size. These are usually of a roundish or flattened Figure, and are marked on their Surfaces with several Series of Striæ rising a little above the Level of the other Parts, and forming a Kind of clouded or undulated Lines. It feels soft and fine between the Fingers, and when broken, is found to be composed of a Multitude of irregular Fasciæ or Bundles as it were of undulated Striæ, the same with those which shew themselves on the Surface. Sometimes however, these Striæ are obliterated and the whole appears an uniform Mass, and not unfrequently it has Veins of a fine gold Colour in it. These are formed of the Misy next to be described, and much resemble the Veins of Marcasite which run through several of our *Cornish* Ores. Not unfrequently also the Misy and Chalcitis are found in the same Mass, one half of which shall be perfect Misy, and the other perfect Chalcitis: the having met with
Masses

Masses of this mixed Kind, is probably what gave the Ancients an Opinion of these two Minerals, gradually changing into one another. The Chalcitis is always of a dusky brownish red Colour, and much resembles in that respect unpolished Copper. Those who have described it as being yellow have confounded it with the Misy, or else have misunderstood the Term *Æri Similis*, by which some of the *Latin* Writers have described its Colour, to signify of a brass Colour, whereas it was meant to express that of Copper.

The strongest Acids are not able to dissolve the Chalcitis, whether pure or mix'd with the Misy, but Water in either Case takes up a considerable Part of it. In the Fire it first calcines to a yellowish Colour, not unlike that of calcin'd green Vitriol or Copperas, and like that in a stronger Fire it becomes of a deep Purple.

It is very frequent in many Parts of the *Turkish* Dominions, where they have it in frequent Use in Medicine as an Astringent and Styptic; they burn it to a kind of *Colcothar*, and give it in Hæmorrhages with very great Success. They also use it externally to stop bleeding, sprinkling the fine Powder of it upon Wounds.

The Virtues of the Chalcitis of the Ancients do not agree more perfectly with what this Substance is now found to possess, than the Characters they have given us of it in their Descriptions. *Dioscorides*, who is much the best Describer of the fossile Part of the *Materia Medica* of his Time, of all the *Greeks*, tells us that Chalcitis is of a copper Colour, and that it is friable, not stony; and that it is variegated with shining Streaks or Veins: every Part of this Description perfectly agrees with the Chalcitis now in Use among the *Turks*, and this on examining it by Solution in Water, appears very evidently to be an Ore containing both the Vitriols of Iron and of Copper. If a Dram of it be powdered and boil'd in four Ounces of Water and the Liquor be filtrated and evaporated to a proper Standard, Crystals of a blueish green Colour and of a rhomboidal Form will be found shot about the Sides of the Vessel: these if wetted and rubb'd on the Blade of a Knife, or on any other polish'd Surface of Iron, will precipitate a Crust of Copper over it, and mix'd with an Infusion of Galls they turn it into Ink, they are therefore truly of the Nature of the blue green native Vitriol of the *German* Mines. A Dram of the Chalcitis carefully treated will yield eighteen Grains of them.

At present we know nothing of its Virtues in *Europe*, it stands indeed among the Ingredients of the *Venice* Treacle and some other Compositions, but its Place is generally supply'd in these with common green Vitriol calcin'd to a redness. The ancient *Greeks* held it to be one of the more slightly corrosive Medicines, and used it in Hæmorrhages externally, and in small Quantities in Collyriums for the Eyes. They also have recommended it in Ointments for the Herpes and Erysipelas, but they never ventur'd to give it internally. Among the *Romans* it was however received as an internal Medicine, upon much the same Footing as it stands now among the *Turks*.

M I S Y.

This is a second of the vitriolic Minerals in Use among the *Greeks*, and which principally differs from the Chalcitis, in that it contains no cupreous Vitriol but only that of Iron. This is also generally given up at present as one of the lost Fossils of the Ancients, but if we will attend to their Descriptions of it,

it, and examine the Bodies sent us from the *German* and *Hungarian* Mines under the Name of Marcasites, we shall not fail to meet very frequently with it. It is a very beautiful Mineral, of a fine bright yellow Colour and of a loose and friable Structure; though in some Pieces considerably harder and firmer than in others. It very much resembles the golden Marcasites of our, and of the *German* Mines, but that is less heavy. It is found sometimes in detach'd Masses in the manner of our Marcasites. These are of a very irregular Structure and rough Surface, often rising into a Sort of Efflorescences, but never emulating the cubic Figures of those Bodies: more frequently however it offers itself in the Mines in Form of broad and thin Veins, filling up the horizontal Cavities between Strata of ferruginous Stones. It easily breaks between the Fingers, and may be crumbled into a coarse Powder which consists of a Number of very irregularly angular Particles; and it is sometimes found loose and in Form of this Powder, hanging about other Minerals, particularly about some of the ferruginous and antimonial Ores. It is not soluble in any Acid, nor makes the least Effervescence with any of them. If thrown into the Fire it does not emit any Flame, but calcines in a few Moments into a deep blood red Powder. Water is a Menstruum that very readily discovers what it contains. A Dram of pure Misy reduced to Powder and boil'd for some Time in a Quarter of a Pint of Water, if that Liquor be filtrated, evaporated to a Pellicle, and set to shoot, will afford more than one third of its Weight of pure green Vitriol, no Way different from our common Copperas, either in Appearance or in its Effects, the smallest Quantity of it turning a Decoction of Galls into Ink.

It is very frequent in the *Hungarian* Mines and in many of the *German*. We have it not in *England*: We have many Substances that resemble it and that yield green Vitriol, but they are all inflammable and of the pyritical or marcasitic Kind. The Ancients had it from the Island of *Cyprus*, and used it to the same Purposes with the Chalcitis, but they esteem'd it yet milder than that: at present it is no where put to any Use, nor indeed merits it, as it can have no other Virtues than those of green Vitriol, though we are not sure what pernicious Substances it may be mix'd with.

It is often found running in Veins in the true Chalcitis, and makes a very beautiful Variegation in that Fossil. In some of its laxer Masses it has greatly the Appearance of a coarse native Sulphur, and has a Place among the Sulphurs in the Cabinets of some People, who have not been at the Pains of trying whether it was inflammable or not.

SORY, quod RUSMA RECENTIORUM,

Sory, call'd Rusma by the Moderns.

Sory is like the other vitriolic Minerals, a compound Fossil form'd of a Mixture of metalline, sulphureous and terrestrial Matter, containing Copper reduced to the Form of a Salt by the Acid of its Sulphur, and in that State blended in imperceptible Particles with the rest of the Matter of the Mass: as the Misy is a pure Ore of green Vitriol, and the Chalcitis a mixt one of blue and green Vitriol, this Sory, or as the World has of late been taught to call it, Rusma, is truly an Ore of blue Vitriol, or of the Vitriol of Copper alone, there not appearing to be a Grain of any Thing approaching to the Nature of Iron in it.

It is found in loose and detached Masses of various Sizes, from that of an Egg,

Egg, to such as weigh six or eight Pounds. These are of a rude and irregular Figure, of a rough Surface often wrinkled, crack'd, and full of Prominences and Depressions, and of a blackish Colour; they are considerably heavy and so hard that when newly taken up out of the Earth there requires a very smart Blow to break them.

When broken they are found to be throughout of a spongy cavernous Structure, not black as on the Out-side, but of a deep dusky iron Colour, sometimes uniformly the same throughout the whole Mass, and sometimes variegated or streak'd with a reddish, a blueish, or a greenish Colour. They are generally moist on the Out-side, and not unfrequently have fine capillary Efflorescences arising from some Parts of their Surfaces, principally from the Cracks and Hollows. They are of a very disagreeable Smell, especially when fresh broken, and of an austere, acrid and nauseous Taste. If laid on the Fire they emit a greenish blue Flame with an insufferable Stench, and finally calcine to a dusky reddish Powder.

The Sulphur contain'd in Sory is evident from this Flame, the greenish Colour and peculiar Smell of which seem also to indicate that there are some Particles of Orpiment among the rest of its constituent Matter. The Vitriol, though too intimately blended with the rest to be distinguishable by the Eye, manifests itself very readily to the Taste if but the Tip of the Tongue be apply'd to any Part of it. This Salt may also be separated from its proper Form by a very easy Process. If a Piece of the Sory be beat to a coarse Powder and exposed to a moist Air for three or four Days, and after that boil'd in six times its Weight of Water, and the Liquor filtrated and evaporated in the usual Manner to a Pellicle, and then set by in a cool Place to shoot, there will be found Crystals of pure blue Vitriol adhering to the Sides and Bottom of the Vessel.

These are the Characters of the Substance now used among the *Turks* under the Name of *Rusma*, and these agree so perfectly with the Descriptions the Ancients have left us of what they call Sory, and with the Effects they have recorded of it, that there is not the least room to doubt their being the same Substance.

Dioscorides tells us that their Sory was Black, full of small Holes, moist on the Surface, and of a nauseous Taste and virose Smell; and the Description which *Bellonius* gives of the *Rusma*, which he saw in Use in the *Turkish* Dominions, agrees perfectly well with this, as do also the Specimens of the Body itself sent from thence, from some of which the preceding Characters have been form'd.

The Ancients found their Sory in *Ægypt* and all the Country thereabouts, as also in the Island of *Cyprus*, and in *Spain*. At present it is dug in several of the Islands of the *Archipelago*, and in many Parts of the *Turkish* Dominions. It is not however confin'd to that Quarter of the World, but is found also in great Abundance in many Parts of *Germany*. The *Turkish* *Rusma* is usually harder than the *German*, but both have the same nauseous Smell, both the same external and internal Appearance, and both answer alike to the Tests by Fire and by Solution. The *German* indeed usually contains some Quantity of Iron with the Copper, and precipitates an ochreous Earth to the Bottom of the Solution, which the *Turkish* does not, but if the Point of a Knife be dip'd in that of either, it is immediately cover'd with a thin Crust of Copper, and the *German* as well

as the *Turkish* affords Crystals of a pure cupreous Vitriol. It is less rich in Vitriol however than either the Chalcitis or the Misy. Two Drams of the *Turkish* Rufma I have found to yield eighteen Grains of Vitriol, and the same Quantity of the *German* about twenty. The *Turkish* Kind is used by the Ladies as a Depilatory. They mix two Parts of Rufma in fine Powder with one Part of Quick-Lime, and make the whole into a Paste with Water: they lay a Piece of this on any Part of the Skin from whence they would take the Hair, and after five or six Minutes, washing it away with warm Water the Hair falls off with it: Many hundred Weight of Rufma are annually used there in this manner. There are some also who venture to give it internally as an emetic: four Grains of it are a Dose: It operates very violently, beginning almost from the Moment in which it is swallowed, which is the Case also with all the cupreous Salts. The blackest Rufma, and that which is least hard, is esteem'd the best; and in this, as well as in its Virtues and Uses in general, the *Turks* perfectly agree with the ancient *Greeks*.

The Rufma found among the *Turks* is generally dug at four or five feet Depth, and lies among Strata of a loose blackish marly Earth, in the manner of our common Pyrites in the Clay-Pits about *London*. In *Germany* they meet with it at greater Depths, and always about Copper-Mines; though they have it however in great Abundance, they know nothing of its Name or Virtues. They work it for blue Vitriol, and sometimes send Specimens of it to their foreign Correspondents under the Name of a black vitriolic Marcasite.

MELANTERIA.

This is a fourth of the vitriolic Minerals, well known among the ancient *Greeks*, but to which the World in general are as much Strangers at present as to the rest. It is a very beautiful Fossile of a dense, compact, and regular Texture, and of an extremely bright and beautiful pale Yellow, resembling nothing so much as that of the purest Gold. It is remarkably heavy, and is usually found in little Masses of the bigness of Pigeons Eggs, very rarely much larger. These are of a perfectly irregular Figure, usually full of angular Prominences and Depressions, and of as bright and beautiful a Colour within as on the Surface of the Mass; these Masses are broken with a slight Blow, and usually exhibit somewhat of an irregularly tabulated Structure. This is the most perfect State of the Melanteria, but it is not the most frequent: We usually meet with it in Form of a fine gold colour'd Efflorescence on vitriolic and pyritical Bodies; or else in loose shattery and friable Masses, of a more dusky yellow Colour and friable Texture, in which latter State it so much resembles a native Sulphur that it is frequently mistaken for one. This is soon discovered to be an Error however on putting it into the Fire, for the Melanteria is not inflammable, but calcines to a greyish Powder, which on continuing it longer in the Fire changes to a deep and fine Purple.

It does not make the least Effervescence with Acids, nor is at all affected by them, but Water is as genuine a Menstruum for it as for the other Minerals of this Class: a Dram of it beat to Powder and boil'd in an Ounce and an Half of Water gives it a brackish Taste, and a Piece of polish'd Iron dipp'd into the Liquor is instantaneously cover'd with a thin Crust of Copper. If it be evaporated however and set to crystallize it will be found that Copper is not the only Metal contained in it in the State of Vitriol, nay that Copper is but in very

small

small Proportion to the Iron it contains. The Crystals it Forms are of a greenish Colour with a Cast of Blue, and answer to all the Tests of the common green Copperas, except that they manifest some small Portion of the blue or cupreous Vitriol with the ferrugineous on every occasion. It is frequently met with in the *German* and *Hungarian* Mines. The Antimony Ore of the latter is often covered in Part with it. It is also found in considerable Plenty in the *East-Indies* and in *America*.

The *Greeks* used this, as they did the Chalcitis, externally, as a gentle Escharotic and a Styptic: they made it an Ingredient in their Ointments for old Ulcers, and they used to sprinkle the Powder of it on fresh Wounds to stop the Hæmorrhage.

The *Greeks* evidently meant by their Name Melanteria the very Substance which is here described, and which is common enough in the Collections of the Curious, though generally misunderstood and confounded, either with the Sulphurs or Marcasites.

Dioscorides plainly knew it in both its Forms, he tells us some of it was found concreted like a Salt about the Mouths or Adits of the Copper-Mines, and some farther in, which was more firm and solid. The Physicians of those Times esteem'd that the best which was of the Colour of Brimstone, and which was lightest and most friable. Some of the old Authors tell us, and some of the Moderns, who we presume never saw any Melanteria, or half the other Things they have wrote about, copy it from them, that Melanteria turns Black immediately on being touch'd in any Part by Water.

The Melanteria we have described has not this Quality, nor indeed is it easy to conceive how any Fossil that had it, should escape being turn'd Black within the Bowels of the Earth, where it is not easy for any Thing to be kept securely out of the Way of Contact with Water: Probably the Account is founded only on an Error in the Copy of some one of the Ancients, from whom the rest, faithful in preserving Blunders, whatever becomes of Knowledge, have all taken it.

P Y R I T E S,
The Fire-Stone.

This is a compound metallic Fossil, always composed of Vitriol, Sulphur, and an unmetallic Earth, but containing these several Ingredients in very different Proportions in the several Masses, and often having others mix'd with them. It appears in very different Forms in its several States, sometimes in larger sometimes in smaller Masses, and these sometimes of a granulated or simple uniform Structure; sometimes regularly striated. Some of them are found naked in the Earth, and others covered with a Crust of a ferrugineous Matter; in some the Striæ terminate in a smooth Surface, and in others they run into Plates at their Ends, shewing themselves either on the Surface or in the Hollows of the Mass.

These are the principal Varieties of the Pyritæ of indeterminate Figures, but beside these we meet with Masses of them regularly figur'd and angular: Some of these are cubic, or composed of six Planes, others of an octohedral and others of a dodecahedral Figure: The octohedral ones very much resemble the Figure of the rough Diamond in its most perfect State, being composed of two short quadrilateral Pyramids apply'd Base to Base. All this Variety of Bodies

are much the same in their constituent Matter, and all come not improperly under the Name of Pyrites : What the Authors who have treated of the *Materia Medica* seem to have had their View in their Descriptions of the Pyrites, seems to have been the common greenish shapeless Kind found in our Clay-Pits, out of which the green Vitriol or Copperas is procur'd : This therefore is the true Pyrites of the Shops.

This is the most common of all the Pyritæ, and appears to us under the greatest Variety of Forms of any Fossil of this Kind. It is a dense, firm, hard Body, of an even and uniform Structure, neither striated nor granulated, and is of a very remarkable Weight. It is most usually found in flat Masses of uneven Surfaces, and from one Inch to ten or more in Length, of various Breadths and Thickneses : Sometimes however it is found in roundish Masses like Pebbles, and sometimes in irregularly protuberant ones like our common Flints. The Surfaces of these Bodies are always smooth, and in this State it is never covered with any Coat or Crust. Its Colour is a dusky greenish with somewhat of a silvery Cast among it. It has its Name Pyrites or Fire-Stone from its giving Fire on being struck against a Steel : It does this much more freely than a Flint will do, and all the Sparks burn a longer Time and grow larger as they fall, the inflammable Matter struck from off the Stone burning itself out before the Spark becomes extinguished. It will not ferment with any Acid, nor is there any known Solvent for it in its natural State ; but after it has been some Time exposed to the Air it begins to shoot, and at length becomes covered with Efflorescences of Vitriol, soon after which it falls to Pieces.

It is found in our Clay-Pits, and under the Cliffs of the Sea-Shore, where there are Strata of this Kind of Clay in very great Abundance, and that not only in its native Form as we have here described it, but in that of fossile Wood, of Syringoides, and Casts of Shells of various Kinds, particularly of the smaller Buccina. In any of these Forms it is the same Substance, and will serve for all the same Purposes. It is recommended by some Authors as an Emmenagogue, but it is very injudicious to give it in this Intention : What Virtues it has of this Kind can be only owing to the Salt of Iron or green Vitriol it contains, and it is much better to give that alone than in such Mixtures as it has in this Fossil. The common green Vitriol, or Copperas of the Shops, is made from this Fossil, and an Acid somewhat different from that of pure Vitriol may be drawn from it by the Retort, after it has been exposed to the Air till it moulders away ; this is of great Use in Mineralogy, and is a Solvent for several Fossils that none of the other Acids will touch.

M A R C A S I T A,
Marcasite.

The Term Marcasite has been very improperly used by some for Bismuth, and by others for Zink. The more accurate Writers however always express a Substance different from either of these by it, a sulphureous and metallic Mineral in its native State. This Substance, properly and distinctly call'd Marcasite, is very nearly ally'd to the Pyrites in its Nature and Qualities, though it differs considerably from it in its external Figure. The Marcasite is a solid hard Fossil, of an obscurely and irregularly foliaceous Structure, of a bright glittering Appearance, and naturally found not in loose Nodules, as the Pyrites, but in continued Beds among the Veins of Ores, or in the Fissures of Stone. The

Variety of Forms this Mineral puts on is almost endless and innumerable: As it is generally found among the Ores of Metals it is frequently impregnated with Particles of them, and of other fossile Bodies, and thence assumes various Colours and Degrees of Hardness; there are however only three distinct Species of it, which are all easily distinguished by their Colour, the one being of a bright gold Colour, the other of a bright silver Colour, and the third of a dead white; of these the silvery one seems to be that peculiarly meant by the Writers on the *Materia Medica* in their Descriptions, and therefore is to be received as the Marcasite of the Shops.

This is a very beautiful Fossil, remarkably heavy and of a very compact though irregular Structure. It is sometimes found filling up whole Fissures in the Rocks in Mine Countries, and forming Veins from an Inch to a Foot or more in Thickness and running to a great Extent; but it is more frequently met with in large irregular Fragments among the Masses of Ore in the Veins. It is always bright and glossy on the Surface, and when broken appears yet more splendid and of an irregularly laminated Texture; the flakey Matter it is composed of is not regularly and evenly disposed as in most other Bodies of this Sort of Structure, but is oddly contorted and wav'd, and the several Flakes wrap'd round about one another in such a manner as to hold very firmly together. In some of the Masses this is more visible, in others less, and in some the whole constituent Matter is so intimately blended that the Plates are scarce at all distinguishable, and the whole Body of the Matter seems one solid uniform Substance. Its Colour is an extremely bright and glittering White, much resembling that of Silver, but with a Glare that this Metal never has when ever so highly polished. Struck against a Steel it very readily gives Fire, and the Sparks burn a long Time: It will not ferment with Aqua Fortis nor be dissolved by any known Menstruum. If put into the Fire it emits a pale blue Flame, attended with a thick white Smoak of an insufferable Stench of Sulphur, and often with something of the garlick-like Smell of Arsenic along with it; and in fine calcines to a deep purple Matter perfectly resembling Colcothar of Vitriol. This as well as the other Marcasites is frequently found debased from its pure State here described, by an Admixture of the Ores of Metals, as Lead, Tin: Sometimes Cubic, or other regularly figur'd Pyritæ are immers'd in it; and sometimes it is elegantly foliated at the Top.

It is very frequent in the Mines of *Cornwall*, where the Workmen call it Mundic. It is also found in *Darbyshire*, *Yorkshire*, and many other Parts of *England*, but much more frequently in *Germany*, where they extract Sulphur and Vitriol from it. It always contains these two Substances, and beside these it has usually a Quantity of Arsenic in it. It has been recommended by some after Calcination as an excellent Styptic, and doubtless it possesses the Virtues of a Colcothar of Vitriol, but it is full as judicious to use that Preparation of the pure Salt as this, in which, notwithstanding that the Arsenic is carried off, there may yet remain Particles that are very little agreeable to the Purposes it is given for.

F O S S I L E B O D I E S

Used in M E D I C I N E.

C L A S S the F I F T H.

I N F L A M M A B L E F O S S I L S.

TH E Bodies of this Class carry so strong a Character, even in their classical Name, that there need nothing be added to it, the approaching the Flame of a Candle to them sufficiently discovers them under whatever Form they may be found: To this it may be added however, that they are in general soluble in Oil, and afford a disagreeable Smell while burning.

Of the Number of the inflammable Fossils used in Medicine some are solid and others fluid; some fine and pellucid, and others coarser and opaque.

Of the solid, and in some Degree pellucid, inflammable Minerals used in Medicine, there are four Kinds.

1. SULPHUR. 2. AMBER. 3. ORPIMENT. 4. SANDARACH.

Of the solid and opaque ones there are four.

1. AMBERGREASE. 3. JET.
2. BITUMEN JUDAICUM. 4. CANEL COAL.

Of the Liquid inflammable Fossils used in Medicine there are five.

1. PETROLEUM. 3. PISSASPHALTUM. 5. OLEUM TERRÆ.
2. NAPHTHA. 4. BARBADOES TAR.

Of these in their Order.

Of inflammable Fossils which are solid, and in some Degree pellucid.

C H A P T E R I.

SULPHUR,
Brimstone.

TH E Sulphur or Brimstone used in the Shops is of two Kinds, the one call'd native, the other factitious; the former being found naturally pure in the Earth, the latter having been lodged in other Bodies, and from thence separated by means of Fire into the Form in which we meet with it.

These two Kinds however, when genuine and pure, are wholly the same in every Respect. Their Characters are, that they are dry, solid, but friable Bodies, melting with a small Heat; inflammable, and when fired in the open Air, burning almost wholly away with a blue Flame and a noxious Vapour; endued with an electric Power; and not dissolved in acid Menstruums.

The factitious Sulphur is much the most common in the Shops. It is sometimes met with in very large Masses, and called Sulphur in the Cake, but what we most frequently see of it is in oblong cylindric Rolls of a yellow Colour, sometimes with, and sometimes without an Admixture of greenish. The yellow contains less, the greenish more of the vitriolic Salt mixed with it; it is friable and affords a Sort of cracking Noise when rubbed between the Fingers; it is very easily reducible to Powder, and melts with a small Degree of Heat. It may be totally sublimed in a close Vessel without Alteration; it takes Fire on being brought into Contact with a burning Coal or any ignited Matter, and when pure and genuine; for we are liable to great Cheats in Regard to it, it does not burn away very quick, but continues a considerable Time, emitting a deep blue Flame. It is to be chosen for internal Use of the purest and brightest yellow, light, easily broken, and appearing very bright and glossy where it breaks. If it be for making Oil of Sulphur the greenish Rolls are the best, as containing most Acid.

This Kind of Sulphur is separated by Means of Fire from various Minerals, which are found naturally to contain it. The greatest Part of what we have is made from the common vitriolic Pyrites, the same Mineral yielding both Sulphur and Vitriol, and often Alum. They first give it a Degree of Fire sufficient to melt the Sulphur it contains, and when this is all run out into Vessels prepared to receive it, they expose the remaining Matter to the Air, after which they boil it in Water, and obtain from the *Lixivium* the common green Vitriol or Copperas; and after all this is obtained, by adding an Alkali to the same Liquor, they get Alum from it. In some Places they work an argillaceous Earth for Sulphur; this is usually of a whitish Colour, variegated with Veins of red, and of a dusky blue. From this they separate large Quantities of the common Brimstone only by Fusion in close Vessels luted together, and that which contains the Ore placed in an inclining Posture; so that as soon as the Sulphur melts it must run into the other Vessel which serves as a Receiver, and which is generally filled in Part with Water. These Bodies have sometimes the Form of Cucurbits or long Necks, and sometimes of Retorts, and the Process is vulgarly called Distillation; but it by no Means agrees with what we usually understand by that Word. The Sulphur is never raised in Vapour, but in all these Cases is barely fused, and the Vessels are so placed that any Thing liquid in the one must run into the other. Sulphur is seldom produced pure by the first Operation, but is afterward purified by repeated Fusions, some of the heterogeneous Matters it brought over with it separating to the Bottom, and others floating to the Surface; it is separated from the lighter by skimming them off, and by the heavier by pouring it carefully from its Sediment: when thus rendered sufficiently pure, it is cast into iron cylindric Moulds, greased on the Inside with Linseed Oil, to prevent its sticking to them, and is thus formed into the Rolls we meet with it in.

This

This is the History of the common factitious yellow Sulphur, we might indeed vastly increase the Number of its Ores, since there are Multitudes of other Fossils, in which true genuine Sulphur is contained, but we have given only those which are worth the working for it.

The other or native Sulphur is of four Kinds, extremely different in Colour from each other, and some of them containing Particles of other Substances, and those often of a very wrong Kind for medicinal Purposes among them. The four Kinds of native Sulphur are, 1. The yellow, which is very pellucid, and is the best of all for Medicine, being perfect pure Brimstone. 2. The greenish, which is more opaque and contains a larger Portion of Vitriol. 3. The grey, which is foul and earthy, and 4. The red Sulphur, which is very beautiful, being perfectly pellucid and of a fine Colour, but which is the last of any to be received into the Shops, as it always contains some Arsenic in it.

The first Kind, or yellow native Sulphur, is what ought to be sold in the Shops under the Name of *Sulphur vivum*. It is transparent as the finest Amber, and is found in Masses from the Size of a Pea, to that of four or five Ounces Weight. A native Sulphur equally pure with this is also found in Form of Powder, resembling the common Flower of Brimstone, encrusting the Sides and Covers of sulphureous Springs, as those of *Aix La Chapelle*; and it is sometimes also found in Form of Icicles or Stalactites hanging from the Rocks about the burning Mountains; in this Case its Figure seems in some Degree owing to the Fire. In its purest solid Masses it is found in the gold Mines of *Peru*, and in some of the *Hungarian* and *German* ones. This is the same Sulphur, whether found in Form of Stalactites or Powder, or of these solid and transparent Nodules; and this is the only Kind that People ought to buy who take native Sulphur internally, without any farther Preparation than powdering.

The hard greenish Sulphur is that called by some Bezoardic Sulphur, from its being sometimes found concreted round Nuclei in Form of the Bezoars. It is more firm and solid than the yellow, and is scarce at all transparent. The yellow Kind, when accidentally tinged with green, as it sometimes is, ought to be rejected from internal Use, much more this. But this is excellent for the making the Oil or Acid of Sulphur. This is principally found about the burning Mountains, particularly about *Vesuvius*.

The third or grey Kind is a very poor and coarse Sulphur, but is what we usually meet with under the Name of *Sulphur Vivum* in the Shops. It does not melt clear and smooth like the pure Sulphurs, but boils and bubbles, and after burning leaves a large Remainder. This very little deserves the Place it holds in our Shops, being much more properly treated in *Italy*, where it is esteemed no more than an Ore of Sulphur, and is worked for it in the Manner of the Earths we have above described, and common yellow Roll-Brimstone is made from it. It is found in vast Abundance about the burning Mountains, and in many other Places, particularly at *Sulfatara*, where it is of the Number of the Ores worked in the common Way.

The fine red Sulphur is infinitely the most beautiful of all the Kinds. It is as transparent and as bright as a Gem. It melts more slowly than any of the other Kinds, and when in Fusion sends out a very disagreeable Smell, like that of Garlick, beside the common sulphureous Vapour. This is a Proof of its

its containing Arsenic, from which also it probably has its Colour. It is found principally in the gold Mines, and is supposed to contain some Particles of that Metal, but my Trials have been in vain to separate any from it.

Of these several Kinds of Sulphur, the common Roll-Brimstone, and the pure yellow native Kind are the only ones proper for internal Use in their crude State; but the Flower of Brimstone faithfully prepared is perhaps preferable to these. We know that Sulphur rises unaltered in Sublimation, and consequently that we have it in its true State in the Flowers; and we are more safe this Way than any other, from taking any Thing that we did not intend to take with it.

Sulphur under whichever of these Forms it appears, is still the same in all its Characters. It dissolves in Oils, and in alkaline Substances. It grows red when melted, but it becomes yellow again when it cools. It affords an Acid the same with that of Vitriol if its Fumes in burning be caught in a proper Manner; but it will not yield this Acid by the common Way of Distillation; but instead of separating into its Principles, rises altogether to the Head of the Vessel in Form of Flowers.

Sulphur melted with Gold, provided that Metal be pure, makes no Sort of Alteration in it; but this is the only Metal that escapes its Effects. Thrown upon Silver heated red hot, that Metal immediately melts, and if taken from the Fire as soon as it does so, it will be found, when cold, to resemble Lead rather than what it really is. It retains its Malleability perfectly, and cuts easily with a Knife; but it is of a dull blueish Colour. It is easily reduced to its proper Appearance again however; for there requires no more to this, than the keeping it a few Minutes in a strong Fire to burn away the Sulphur. If the Heat is slackened toward the End of this Fusion, the Silver will not fall into one uniform Mass, but will rise up in small Sprigs all over the Surface in a very beautiful Manner, resembling the Branches of Silver, sometimes seen on the Surface of Ores. Tin melted with Brimstone, if the Metal be first granulated, and the Brimstone added in Powder in three Times its Quantity, deflagrates as if Nitre had been mixed with it. The Remainder becomes solid while yet in the Fire, and when cold is a brittle Regulus of the Colour of Lead, and greatly resembling a Semi-metal in its Qualities. Tin may indeed be wholly turned into Scoriæ by burning it with additional Parcels of Sulphur. Sulphur melted along with Lead destroys its Malleability, as much as it does that of Tin. It becomes hard and rigid, and very difficult of Fusion; and loses the Appearance of Lead, being, in the Regulus thus obtained, composed of broad, bright and glittering Particles. Copper melts immediately upon being made red hot if Brimstone be added to it, and becomes a black friable Substance. Iron of all other Metals melts the most freely and readily with the Sulphur, but it does not freely part with it again. A red hot Iron applied to a Roll of Sulphur immediately throws off Particles dissolved by the Sulphur into a spongy Scoria. Regulus of Antimony melted with Sulphur turns to common crude Antimony again. Bismuth melted with it assumes the Appearance of Antimony, and instead of broad Flakes is found to be composed of Needles or Striæ running across one another. Zink suffers less Change from it and mixes indeed less easily with it; it at length becomes darker coloured, and more brittle.

The Chemists have told us various Ways of making Sulphur by Art, that shall
be

be wholly like the Native, and nothing is more certain than that it may be done. The vitriolic Acid and an inflammable Oil properly combined will always afford it. If four Parts Oil of Turpentine, and one Part Oil of Vitriol be mixed together in a Retort, and after standing to digest together a Week or more, a Fire be given under it and a large Receiver well luted on, a peculiar oily Matter will come over into the Receiver, true Sulphur will be sublimed into the Neck of the Retort, and the remaining Matter in the Bottom of it will be formed into a Kind of Bitumen.

We may see by this how nearly Sulphur, Vitriol and the common Bitumens are allied to one another, and what Sort of Processes Nature uses in the producing them. The Antients, as far back as we have any Accounts of them, seem to have been always acquainted with Sulphur. The *Greeks* called it *Theion hōly*, and used it in their Sacrifices and Expiations. The *Arabians* mention it under the Name of Kabrie or Chibur. It is of great Use in Medicine in its crude State, and affords as many valuable Medicines in its several Preparations. It is also of great Use in many of the Arts. Gunpowder owes its Power in a great Measure to it. Its Fumes check and prevent Fermentation, for which Reason it is much used by our Wine Coopers; and they bleach or whiten Stuffs by means of them.

In Medicine it is in its crude State given with great Success in Diseases of the Lungs. It strengthens and cleanses them and promotes Expectoration, and it has at all times been famous for its Virtues against cutaneous Diseases. It generally proves a little loosening to the Bowels, and increases the Discharges by Perspiration; it even communicates its Smell to the perspired Matter for a considerable Time after taking it, and will often blacken Gold or Silver that is worn by People who take any considerable Quantity of it.

The Preparations of Sulphur in most frequent Use in the Shops are these, 1. *Flores Sulphuris*, Flower of Brimstone. 2. The *Sulphur præcipitatum*, or precipitated Sulphur, commonly called *Lac Sulphuris*. 3. The *Balsamum Sulphuris*, Balsam of Sulphur. 4. The *Aqua Sulphurata*, or Sulphurated Water. 5. The *Spiritus Sulphuris*, the Spirit or Oil of Sulphur.

FLORES SULPHURIS,
Flower of Brimstone.

Take four Ounces of common roll or native yellow Brimstone, put it into an earthen Cucurbit, lute on a Glass Alembic Head and bury the Cucurbit up to the Neck in Sand: place it inclining in such a Manner that any Liquor collected in the Head may easily run out at the Pipe; make a gradual Fire, and continue it till the Head is seen sprinkled over with Flowers; a little Phlegm will then come over into the Receiver; after this increase the Fire till by Degrees the Rim of the Head be so hot as to begin to melt the Flowers, diminish it again till a little below this Standard, and keep it so for about eight Hours: when the Vessels are cold separate them, and the Sulphur will be found sublimed into the Head in form of Flowers. These Flowers are Sulphur very little altered, the Brimstone is attenuated and purified by the Sublimation, but in other Respects it is not changed. It becomes more fit for internal Use by this Attenuation, and more proper for dissolving into Balsams and other Preparations. The common Flower of Brimstone sold in the Shops is made by the same sort of Process only in a large way, but it is better for People who intend

tend it for medicinal Use to make it thus themselves, as they are then certain there is no Adulteration. In the large way they use instead of Cucurbits large Furnaces divided into two Chambers, in one of which the Sulphur is put, and in the other which communicates with it, but is kept cold, the Fumes gather in Form of the Flowers: this is so easy and cheap a Process, that the Flowers may be sold almost as cheap as the crude Sulphur; but the People who deal in Quantities of it are not content without sophisticating it, they do this sometimes by no better an Addition than that of common Flower.

SULPHUR PRECIPITATUM, VULGO LAC SULPHURIS,

Precipitated Sulphur, commonly called Milk of Sulphur.

Take Flowers of Sulphur one Pound, Quicklime that is fresh made and not stony three Pounds, put these into two Gallons of fair Water, and boil the whole till the Sulphur is dissolved; filter the Solution thro' Paper and add to it, by a few Drops at a time, weak Spirit of Vitriol till it become turbid, and in fine it will precipitate a white Powder to the Bottom of the Vessel; pour off the Water and add fresh several times till the Powder after these repeated Washings become quite insipid.

This is good in all the Cases in which the Sulphur in Substance or its Flowers are used. Its Dose is from ten Grains to two Scruples.

BALSAMUM SULPHURIS SIMPLEX,

Simple Balsam of Sulphur.

Take Flowers of Sulphur four Ounces, pure Oil of Olives one Pound, set them over the Fire in an earthen Vessel, as the Oil grows hot the Sulphur will melt in it, and will fall to the Bottom in Form of a red shining Fluid; after this the Fire is to be increased gradually till the whole Body of the Sulphur dissolves and blends with the Oil into a thick opaque Liquor; great Care is to be taken not to set the Matter on Fire, and the Vessel is to be lightly covered, but the Lid of it, or whatever else is put over it, is not to be fastened down.

This is the Balsam of Sulphur so highly extolled by *Helmont*, *Rulandus*, and our great Mr. *Boyle*. It is not without its Virtues in Diseases of the Breast and Lungs, but those Authors who pretended to cure Consumptions in their worst Stages by it deceive themselves. Its Acrimony will often be injurious to weak Lungs, and it has too often, when injudiciously used, continued and raised the Fever that attends these Disorders. It ought never to be used without great Caution, and a diligent Attendance on its Effects.

Balsam of Sulphur may be made by the same Process with Oil of Turpentine, or any other of the vegetable essential Oils, and with *Barbadoes Tar*, but Caution is to be used in the making the former of these Balsams, that the Vessels be not too closely shut, nor the Fire too violently increased. Balsam of Sulphur made with Oil of Turpentine will explode under those Circumstances with a Force greatly superior to that of Gunpowder.

SPIRITUS SULPHURIS,

Spirit or Oil of Sulphur.

This Acid is wholly the same with that of Vitriol, and therefore it is scarce worth any Body's while to make it in the common way, it being one of the most troublesome Processes in Chemistry. The Vapour of burning Sulphur retained by any means furnishes this Acid: the usual way has been to support a glass Bell moistened on the inside over a Pan of burning Brimstone, and to

catch the Drops collected on its inner Surface in a Receiver, their running into which is to be favoured by the Bells being a little enclined toward the Side where it is placed. *Homborg* contriv'd to make a better Kind of Bell, by cutting a Hole of eight or ten Inches in Diameter in the Bottom of a large glass Receiver, but by the best of these Methods four or five Ounces of the Acid is the most that can be collected in twenty four Hours. Perhaps very large glass Receivers uncut and occasionally opened at the Mouth to keep the Sulphur that has been fired within their Cavity from going out, may serve better than all these Contrivances. It will be easy to keep these Glasses under the Degree of Heat at which this Acid is suspended in Vapour, by the Means of the Fumes of hot Water; and to burn the Sulphur within them in a Pan supported on a Pedestal: The Consequence of this will be, that the Acid of Sulphur being capable of condensing into Drops in a Heat more than equal to that which can be given the Glasses by hot Water, they will be prevented from becoming too hot, for the condensing the Vapours arising from the burning Brimstone, and consequently the acid Spirit, will be formed as long as the Sulphur is kept burning by now and then unstopping the Mouth of the Glass to give it Air.

It would be possible to say more on this interesting Subject, but tho' we would not wish a Secret of so much Value to be lost to the World, neither would we wish to be the Means of preventing a Man, who seems to have found it, from making all the Advantage he deserves of it.

This Spirit is an agreeable Acid, and is good in every Case in which the Spirit of Vitriol is.

AQUA SULPHURATA,
Sulphurated Water.

Take common Water a Quart, pure Sulphur half a Pound: Set a Part of the Sulphur on Fire in an Iron Ladle and suspend it in that State over the Water in a close Vessel, let the Remainder of the Sulphur be afterwards fired and suspended in the same Manner, and when the Operation is over the Water will have acquired a sharp acid Taste and is to be reserved for Use. The most commodious Vessel for the making this is a large Glass Receiver fitted with a wooden Plug, into which the Handle of the Ladle may be fixed: as soon as the Sulphur is fired the Ladle is to be thrust so far into the Receiver, that the Plug may come to stop the Aperture, and the covering the Mouth over this with a wet Cloth will be sufficient to keep in the Fumes.

This is the Liquor called by some Authors, *Gas Sulphuris*. It is an agreeable Acid, and is good in malignant and petechial Fevers given in the common Drink. It quenches Thirst and cools the Mouth and Tongue.

To these Preparations of Sulphur we are to add one more called, in the late *London Dispensatory*, *Flores Sulphuris Loti*, washed Flowers of Sulphur. This is only the common Flowers of Brimstone boiled in fair Water, and afterwards washed with several cold Waters. The Liquor they are boiled in tastes acid, and the Flowers being divested of the Sharpness which it has acquired may be given inwardly afterwards, without that Danger of griping that usually attends the giving them in their crude Form to People of tender Constitutions.

C H A P T E R II.

SUCCINUM,
Amber.

THE Writers on the *Materia Medica* have generally distinguished Amber into three Kinds, a yellow, a white, and a brown; and beside these the Cabinets of Collectors afford us sometimes a greenish, a reddish, and a very beautiful black Amber resembling Jet, except that it is vastly finer. These however are Distinctions of very little Consequence: there is truly but one Kind of Amber in the World, the true and genuine Colour of which is a pale yellow; but as it is evident that this Amber has concreted from a prior fluid State, it is no wonder that among the thousand Accidents attending that Concretion made in the Bowels of the Earth, or on its Surface, in either of which Cases it must be liable to a great Variety of Admixtures also, it should not always be so pure and uniform as to retain its true Colour and Transparence, but that it sometimes is brownish, and sometimes whitish: nor is it wonderful that when it is found in the Neighbourhood of vitriolic and metalline Particles, as it frequently is, it should sometimes, as well as the Crystals, Spars and other Pellucid Fossils, be coloured by an Admixture of them.

Amber is a beautiful Fossil of an even and regular Structure, considerably hard yet very light: It is naturally of a rough, scabrous and uneven Surface, and when rubbed is of a very fragrant Smell; when broken it exhibits a smooth glossy Surface resembling, more than any other Substance, a Piece of fine yellow Refin. It is met with in Masses of very various Sizes and Shapes, many Pieces of it are flat, some of the irregular Shape of our common Flints, but the greater Part of them approach toward Roundness and resemble the common Pebbles in Shape: its more frequent Standard as to Size is between the Size of a Horse Bean and that of a Goose's Egg, tho' it is found in Masses of much larger Dimensions. Its natural Colour, as observed above, is a fine pale yellow, but it is often made white, sometimes black, and in both these Cases is rendered opaque by the Admixture of the extraneous Particles that make it so. Sometimes it has other Tinges from metalline Particles and remains pellucid: its most frequent Variation however from the yellow is into a dusky brown.

The yellow Masses are in general the most transparent, and next to the black, which is very rare, the white is of all others the least so. It makes no Effervescence with Acids, it is of a bituminous Taste with a Mixture of somewhat Acid and Styptic in it, and when rubbed so as to heat, it will attract Straws, Bits of Paper, or any other light Substances, not excepting even the Metals in thin Pieces, as Leaf Brass, or the like; this is an Observation older than any Author whose Works remain to us; we meet with Quotations of one *Diocles* for it in *Theophrastus*.

Amber is one of the lightest Fossils we are acquainted with, it is heavy enough however to sink in Water; it will not soften with the Heat of boiling Water, but with a somewhat greater Degree of Heat in a Sand Furnace, it will grow soft and bend, and will remain in that bent Form; and if the De-

gree of Heat be nicely managed, it may in this Manner be bent into many Forms without Injury to its Hardness or Transparency, but if carried a little too high, it loses its Beauty. Exposed to a naked Fire it melts and flames, appearing then a foaming bubbling Mass covered with a very bright Flame of a reddish white Colour.

Amber is soluble in Spirit of Wine, and in the essential Oils of Plants; it may also be dissolved in some of the expressed Oils, as that of Linseed, but not so easily: on a Chemical Analysis it yields at first a sub-acid Water with an oily fetid Smell, after this a yellow very fetid Oil, and a volatile Salt, and finally a thick and dusky brownish Oil, more fetid than the first; what remains in the Retort is a black light and friable Matter, resembling the *Bitumen Judaicum* in Colour, and sometimes sold by our Druggists under its Name.

The brown Amber affords the greatest Quantity of Oil on the Distillation, and the white the most of the volatile Salt, the yellow is at a Medium in both Respects between these. It is not however possible to judge exactly of what will be the Produce of either Kind before the Trial: I have obtained three Drams and a half of Salt, from a Pound of the white Amber, and from the black a full Dram from three Ounces, which is a considerably larger Proportion: this is generally too precious for Distillation, or indeed for any Experiments, but it is sometimes met with among our Amber too coarse, friable and foul to be of any other Use. *Geoffroy* sets the yellow very low as to the Quantity of Salt producible from it: I am apt to believe he means the brown, for I have obtained more than twice as much of the Salt from the yellow as he allows to it: this in the general, however, I have observed, that the more pure, perfect, and transparent the Amber is the more Oil, but the less Salt it yields. The more opaque it is, always it abounds with the more Salt. Our Clay-pits about *Richmond* and elsewhere near *London* afford a coarse shattery Substance which the Workmen call Rosin. This scarce deserves the Name of Amber for its general Appearance, yet from four Ounces of this I have obtained a Dram and two Scruples of Salt, which is vastly an over Proportion to even the white Kind, which is supposed by Authors to yield more than any other; and even considerably more than the black Amber yields, tho' it affords more than any of the common Kinds.

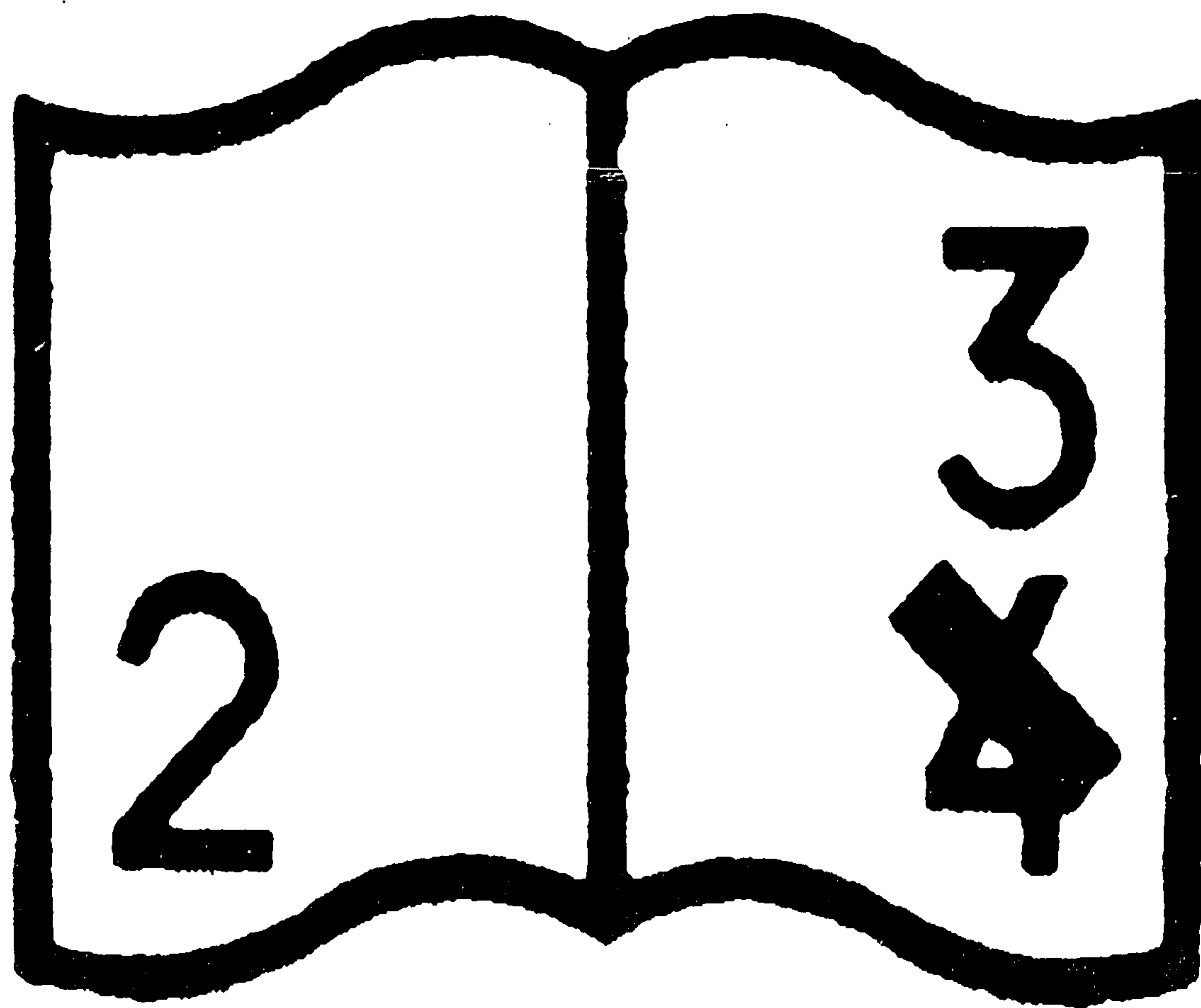
This Salt dissolved in warm Water after the Evaporation of the superfluous Humidity, will concrete into little round Granules like Millet Seeds, and if set in a Sand-heat in a tall Vessel, it will rise by Sublimation to the upper Part of the Glass, adhering to it in form of white Flowers, composed of fine slender oblong *spiculæ*. It is of a sub-acid Taste. It does not ferment with Acids, but if mixed with either a volatile or a fixed alkaline Liquor, as with Spirit of Sal Armoniac or Oil of Tartar *per deliquium*, some Bubbles rise to the Surface of the Liquor as it dissolves in it. The Way of dissolving Amber in Oil is to melt it in a Crucible over a moderate Fire, and when it is perfectly in Fusion to pour it out upon a Marble, when cold it is to be powdered, and this Powder will readily enough dissolve by boiling in Linseed Oil, and thus makes the finest Amber Varnish.

Amber is found at this time in many Parts of *Europe*, but no where in such Abundance as in *Prussia*: *France*, *Italy*, and *Germany* afford it; nor is our own Kingdom without a very considerable Quantity of it. In *France*, *Italy*, and *Sicily*

Sicily it is dug up out of the Mountains ; in *Prussia* it is found in great Abundance on the Sea Shores, and also at different Depths in digging. The whole Kingdom, according to *Hartman*, standing upon a Bed of the Matrix of Amber, which ouzes out sometimes almost at the Surface ; this Matrix of Amber is a kind of laminated Substance resembling fossil Wood, which has lain in the way of the Pyrites, and from hence many have argued for Amber's having been a vegetable Resin in its first State. With us it is found in many Places on the Sea Shores, and in many others in Clay. The Tile Clay-Pits at *Richmond* afford a dirty and friable Amber ; but those nearer *London* often afford a pure and hard Kind. I have five Specimens picked up in the Clay-Pit behind St. George's Hospital, at *Hyde-Park* Corner.

The Ancients were acquainted with Amber from the earliest Times we have any Account of. Authors prior to the oldest we have, are quoted, as mentioning its Properties. But though the Substance was very well known thus early, its Origin was wholly a Secret to the World till very lately. *Dioscorides* and the rest of the *Greeks* tell us of two Kinds of Amber ; the one they call *Pterugophorum*, from its drawing Feathers or other light Substances to it when heated by rubbing ; and the other *Chrysophorum*, from its golden Colour. They also called the former or common brown Amber *Lyncurius*, and had an Opinion that it owed its Origin to the Urine of the Lynx spilt upon the Sands, and then concreted into the Hardness of a Stone ; but this was a very vague Name. They called also the Gem we now call the Hyacinth by the same Name, for the same imaginary Reason ; but this Origin of both was soon discountenanced, and Amber was supposed to be the Resin of a Kind of Poplar, hardened by the Sun and Air : This Opinion however carried as little Probability with it as the other, since it is not the Effect of Heat to harden Resins but to soften them. We meet with it also among the old *Greeks* under the Name of *Hyalos*, the same Word by which they expressed Glass : This they gave it because of its Transparency and glassy Look ; and they also called it *Arpax*, from its Quality of drawing light Bodies to it. Some of the later *Greeks* have called it *Berenice* ; the *Arabians* describe it to us under the Name of *Carabe* ; and the *Latins* under that of *Succinum*, which seems to have had its Origin from their false Opinion of its being originally the Juice or Resin of a Tree.

The Origin of Amber has not only been misunderstood among the Ancients, but our later Writers have been in general as much puzzled about it. In the Time of *Dioscorides* we find it was esteemed a vegetable Resin ; before that it had been declared to be an animal Substance, or the concreted Urine of the Lynx, and afterwards in *Pliny's* Time it was esteemed a vegetable Resin, but was said to flow from some Species of Pine, not from the Poplar, as had before been thought. The Resemblance it bears to the vegetable Resins, gives some Excuse for the mistaking it for one among People with whom the modern Test of Experiments were not in Fashion, we are not now however to doubt but that it is a true mineral Production formed of a liquid Bitumen of the *Naphtha* or *Petroleum* Kind, and of the vitriolic Acid which is every where abundant in the Earth. I have myself produced a Substance perfectly like Amber which had once been melted, from a Quantity of pure *Naphtha*, procured from *Persia* by Mr. *Theobald*, and an Acid drawn by Distillation from the crude Pyrites after shooting in the Air. This artificial Amber, as it may very justly be called,



called, not only smells like, and tastes like, the native Kind, but affords the same Oil and the same Salt by Distillation. There seems indeed to want nothing but our being able to use the same slow and gradual Means by which Nature works in the forming her Productions, to our making artificial Amber by this Means as hard and pellucid as the natural, for those are the only Qualities it wants.

The Flies found in Amber are no Objection to its being formed on the Principles here delivered. If we suppose the greatest Part, as it assuredly is, to be formed within the Earth, this will always be without Insects in it, but if some, as is also very naturally to be supposed, be formed on the Surface of the Earth in little Holes, as the *Naphtha* or *Petroleum* trickles down the Sides of Hills impregnated strongly with the necessary Acid, then it will be easy to conceive that these Pieces gradually hardening in Places where Insects come, may have those Insects bedded in them. What most of all makes for this Opinion is, that none of the Amber dug out of the Earth ever has any Insects in it, but only such as is found on the Surface, or on the Sea Shores.

Amber is the Basis of the finest of all Varnishes. It is used also in Medicine in its crude State, only reduced to Powder as an Astringent and Balsamic. It is given in the *Fluor Albus*, in Convulsions, and in all Disorders of the Nerves. It is also given in Coughs, and in other Disorders of the Lungs, and is by some greatly commended in inveterate Head-achs. Its Dose is from one Scruple to two.

The Preparations of Amber in Use at present are, 1. The *Sal Succini*, or Salt of Amber. 2. The *Oleum Succini*, or Oil of Amber, and 3. The *Tinctura Succini*, or Tincture of Amber.

SAL ET OLEUM SUCCINI,
The Salt and Oil of Amber.

The Process by which these two Preparations are obtained is the same, and they are necessarily both made together. Put a Quantity of crude Amber in the Lumps it is naturally found in, into a glass Retort, so large that only two Thirds of it are filled by it; cut off the End of the Neck of the Retort, so as to leave its Aperture two Inches wide; fit on a large Receiver, and lute it well. Set the Retort in a Sand-Heat, and make the Fire at first very moderate, there will come over an acid Phlegm, and then a thin limpid Oil in a large Quantity, and then a thicker; when no more of this comes, separate the Vessels and keep it by itself. Apply the Receiver again, and raising the Fire to a greater Degree, the Salt will begin to shew itself in white downy Efflorescences on the Inside of the Receiver, and in the Neck of the Retort; encrease the Fire gradually till no more of this rises, then separate the Vessels and collect the Salt for Use. If after this the Vessels be joined again, and the Fire encreased, the black bituminous Matter left at the Bottom of the Retort will become volatile, and will come over into the Receiver in Form of a black thick Bitumen.

The Salt of Amber thus prepared is a true Acid, and is the only known Acid that is obtained in a solid saline Form, no other fossile, vegetable or animal Substance affording it. The Oils greatly resemble the native *Petrolæa* or *Naphthæ*, that is, the Substances from which Amber was formed, by their Union with an Acid now disunited again from them in Form of this Salt,

which

which is truly vitriolic, and of the Nature of that Acid so common in the Earth, to the Mixture of which, with the natural liquid Bitumens, we attribute the Origin of all Amber.

The Salt is to be dissolved in Water and set to shoot, and the oftener this Process is repeated the purer it will be. The Oil is to be rectify'd by a second Distillation in which a thin fine Oil will come over, which is what we know by the Name of Oil of Amber, and a thicker will remain in the Retort, known by the Name of Balsam of Amber.

The Salt of Amber is diaphoretic and diuretic, and is esteemed a very great Medicine in Convulsions, in Head-achs, and in all nervous and hysteric Complaints. Its Dose is from five to fifteen Grains. The famous *Spiritus Cornu Cervi Succinatus*, is only Spirit of Hartshorn, with as much as it will dissolve of a Mixture of equal Quantities of Salt of Hartshorn and Salt of Amber. The Oil is a famous Antihysteric. It is also balsamic, diuretic, and diaphoretic, and is an excellent Medicine in Convulsions, and in all Disorders of the Head and Nerves. Its Dose is from two Drops to ten or more, but it is a very disagreeable Medicine to take. Externally it is of great Use in the restoring contracted, paralytic, weak, and torpid Limbs.

TINCTURA SUCCINI,
Tincture of Amber.

Take fine levigated Amber, grind it in a glass Mortar a long Time with as much Oil of Tartar *per Deliquium*, as will make it a thin Paste; dry this Paste over a gentle Heat, and then powder it, and expose it to the Air to run and moisten again; repeat this three or four Times; at last dry it thoroughly. Rub it to a fine Powder, and put it into a tall Glass with as much Spirit of Wine rectify'd as will cover it three Fingers deep. Shake the whole well together, and set the Vessel in a Sand Furnace, giving such a Degree of Heat as will just make the Spirit simmer, for two or three Hours. Let it stand till perfectly settled, then pour it from the Fæces, and filter it for Use. It will be a bright red Tincture. This Tincture is neither acid, alkaline, nor oily, but holds the whole Body of the Amber dissolved. It has a fragrant aromatic Smell, and a bitterish Taste. It has all the Virtues of the Amber in the Substance. Its Dose is from thirty to forty or fifty Drops. A Tincture may be made from Amber with *Alcohol* alone, but not so strong as by this Addition of an Alkali.

C H A P T E R III.

A U R I P I G M E N T U M,
Orpiment.

O R P I M E N T is one of the most beautiful Fossils we know, when it is pure; but it is much more frequently met with mixed and blended in small Flakes, among a solid Substance approaching to its own Nature, but without its Lustre or foliated Texture. This Substance, distinctly call'd Zarnich, is usually understood to be a Part of the Orpiment; but as there are Masses of Orpiment loose and entire without any of this Substance about them, and as this is also frequently found in large Masses with no true Orpiment among them, and the two Substances have their separate Qualities, the one being

being flexible, the other friable with the least Attempt to bend it; the one foliated, the other granulated; the one perfectly soluble in Oil, the other not; it is very proper to distinguish them.

As those Substances, properly called Zarnichs, in which Orpiment is sometimes lodged, are not received in the *Materia Medica*, unless by Error under the Name of Orpiment, it is not necessary to mention them here, any farther than just to observe, that as the common Kinds of them are green and yellow; it is to this that we owe the Distinction of Orpiment into those Colours; There is indeed in Nature no such Substance as green Orpiment; whatever therefore is seen under the Name of Orpiment and of this Colour is to be rejected, as in great Part Zarnich, it being generally a Mass of the green Zarnich with a little Orpiment in it; and it is a good Rule that nothing be bought under the Name of Orpiment, but what is composed entirely of Flakes or Plates. for no Zarnich is so. The Distinction is the more necessary, as this Zarnich contains a large Quantity of Arsenic in it, and as the common yellow Arsenic of the Shops, which is by a shameful Error frequently offered to Sale under the Name of Orpiment may possibly pass upon an incurious Observer for Orpiment, who has before taken pure Masses of Zarnich for that Mineral, but can never be received as such by any Body who has it implanted in his Memory, that Orpiment is a Mineral composed entirely of Flakes or Plates, like the *Muscovy* Talk.

The true and genuine Orpiment is a foliaceous Fossil, sometimes found in Masses of two or three Inches Diameter, and of an Inch or more in Thickness, composed of Plates so large that one single Plate makes a whole Surface; this is its most pure and perfect Form; but it is more usually met with in smaller Congeries of Flakes, from an eighth of an Inch to a third in Diameter, lodged in a dull, yellowish, or greenish, or whitish Matter, which is the Zarnich above mentioned. In whichever of these States it is found, the Flakes when separated are of the same Nature; every Thing that is truly flaky, in the coarsest Masses being truly Orpiment. It is of a perfectly fine and pure Texture, and remarkably heavy; of a smooth, bright, and glossy Surface, and very soft to the Touch. It is of a beautifully regular Structure, being composed of a Multitude of thin Scales or Flakes perfectly resembling those of the foliaceous Talk, one Flake or Plate always makes up the whole Surface of the Mass however large it be; and these Plates, especially the large ones, are usually more or less bent and undulated; they may be parted by splitting into a great Number of thinner and thinner Flakes, which are very flexible, but which differ extremely from the Talks, in that they are not elastic; they are easily bent into any Posture, and very freely remain in it. Its Colour is a bright and beautiful yellow, much like that of Gold. It is not hard but very tough, easily bending without breaking; and when fresh split it affords a very beautiful glossy Surface; and in thin Pieces is very transparent. This is the pure State of the true Orpiment; but as it is liable to be itself immersed in Masses of a heterogeneous Matter, so it sometimes also has a different Substance of the same Class, a fine red native Orpiment formed of small Scales or Flakes, and much resembling native Cinnabar in Colour, mixed in Lines and Veins in it.

The Specimens thus variegated, make a very beautiful Figure in the Cabinets

nets of the curious ; but till we are more perfectly informed of the Qualities of this red Orpiment than we are at present, it is proper to reject all but the pure and genuine yellow one, from Use in Medicine. This red Orpiment beside the broader and smaller flaked yellow Kinds are all the Species of Orpiment known in the World ; the latter though two distinct Species according to the Systems of Naturalists, are in reality both Orpiment, and there is no Need to distinguish them in Medicine ; only we are to observe, that if the small flaked Kind is used, it is to be first carefully picked from the Zarnich in which it is usually bedded.

Orpiment makes not the least Effervescence with any acid Menstruum, but it is readily soluble in Oil : It melts with a very small Fire, and runs into a red fluid Mass as thin as Water. The Sulphurs appear red while in Fusion, but they become yellow again as soon as they are cold. This Substance on the contrary retains for ever the Redness it acquires by melting, and becomes by this Means the factitious Sandarach, which is of a dark red Colour, of an uniform Texture, bright and semi-transparent, but very brittle. There separates from it in this easy Process a fouler Matter in Form of Scorix.

It is very inflammable, and when set on Fire it burns with a pale whitish Flame, with a Tinge of a blueish Green about the Edges, and with a strong Smell like that of Garlic. While it is burning on the Surface the whole becomes fluid, and runs smooth and even, not bubbling at all on the top : when it goes out it may be lighted again, and will in fine burn away to the last, not leaving any Remainder. The Zarnich on the other Hand, or such Orpiment as is fouled with an Admixture of Zarnich, burns more languidly, and leaves a small Quantity of blackish Ashes behind it.

The Ancients, and some of the modern Writers, indeed not much to their Credit, have declared Orpiment to be only common *Muscovy* Talk, stained yellow by some Accident. In Appearance they indeed resemble one another, but Naturalists should have other Informations beside those from their Eyes on these Occasions. Talk is elastic, and Orpiment is not at all so : This Elasticity is the peculiar Character of Talk, distinguishing it from all other Fossils, many of which are foliated, as the Selenites, &c. but this only elastic : Talk also remains unaltered in the strongest Fire, whereas Orpiment melts readily and as readily burns away.

Orpiment is very volatile, and if kept over the Fire in a close double Vessel, it will be in great Part raised into fine light Flowers of a pale yellow, and much resembling Flowers of Sulphur ; the Remainder at the Bottom of the Vessel concreting when it cools into a dense solid reguline Matter resembling Cinabar, or like the plain melted Orpiment before described, but that it is heavier, of a deeper Colour, and more brittle : if this be put into the same Vessels again, and the Fire urged to a greater Violence, it will almost all rise into the upper Vessel, where it will form a beautiful and bright red semi-transparent Mass ; nothing remaining at the Bottom but a small Quantity of a light loose Earth.

The Fumes of Orpiment received upon a Plate of Copper render it white and brittle : it has been supposed to contain Gold ; and we are told, that one of the *Roman* Emperors caused it to be worked with that Intent, but it does not appear that the Advantage answered the Expence. It is found in the Mines of several Metals, as Gold, Silver, and Copper, and sometimes in the Strata

of Marl or Clay; not unfrequently also it discovers itself on the Sides of Hills, and even on the Surface of the Ground in the *Eastern* Parts of the World. It is frequent in the Islands of the *Archipelago*, in the *East-Indies*, and in many Parts of the *Turkish* Dominions; we have it also in *Germany* and *Saxony* in considerable Abundance. The finest in the World is found about *Smyrna*, where it is not sought after so much as it deserves, and where it might make a very considerable Branch of Commerce.

The Ancients were very well acquainted with this Drug. They were wholly Strangers to the poisonous Substance now known among us, under the Name of Arsenic, and they called this native Mineral by its Name; *Arrenicon*, *Arrenice* and *Arsenicon*, being their common Names for Orpiment. Hence has grown a double Error: People who have not attended to the Distinctions of these two very different Bodies called Arsenic by the Ancients and by the Moderns, have declared Orpiment a Poison, because it was once called by the Name now used to express a Poison; and others have thought even Arsenic itself a Thing that might be used in Medicine, because the Ancients talk of giving what they called Arsenic, that is Orpiment, internally.

The *Arabians* mention Orpiment under the Name of Narneth and Zarnich *Asfar*, to distinguish it from the Realgar, which they called Zarnich Ahmer.

The Errors that have arisen from the Confusion of Names between Orpiment and Arsenic, have not been even to this Time thoroughly set right, some accounting Orpiment a Poison, others an innocent Medicine. It is certain that the Smell of Garlic which Orpiment emits while burning, and its Effect in turning Copper white by its Vapour, favour greatly of its containing Arsenic, since they are Qualities of that Mineral; yet we have numerous Accounts of its having been given with Safety. The Ancients, gave it internally, and ordered its Fumes, while burning, to be received into the Mouth, in Asthmas and Diseases of the Lungs; and the *Chinese* at this Time give it a Place among their cathartic Medicines, after it has been burnt a little.

Among the modern Writers on these Subjects, *Geoffroy* declares it a corrosive and poisonous Mineral, and tells us, that the Symptoms it brings on, are Spasms of the Hands and Feet, Stupors, cold Sweats, Palpitations of the Heart, Swooning, Thirst and Heat, Vomitings and Tormina of the Bowels, and finally Death itself; and adds, that in Bodies opened after Death, brought on by this Poison, the Throat, Stomach, and Intestines have been found inflamed, eroded, and even perforated.

On the other Hand, *Boerhaave* declares Orpiment an innocent and harmless Medicine; and *Hoffman*, who has been at more Pains than any Body to examine into its Nature, declares the same; and even gives Instances of its having been given to Dogs without any Harm. I may add to this, that I have made many Experiments of the same Kind, and have given two Drams at a Time to a Dog, and the same Quantity to a Cat, without the least Injury to them. I don't infer from this, that it is certainly a safe Medicine for Men, though the Probability appears greatly on that Side; but I cannot but observe, that *Geoffroy's* Account of the Effects of this Poison, particularly of its eroding the Throat, Stomach, and Intestines, agrees so perfectly with those of Arsenic, that I am apt to believe yellow Arsenic, which is too often sold under the Name of Orpiment, was the Poison the People he speaks of had taken.

It is an excellent Depilatory mix'd with Lime and made into a Paffe with Water. The Painters are very fond of it as a gold Colour; and a Lixivium of it with Quick-Lime makes the Liquor which renders Letters written with a Solution of Lead visible, at the same Time that it destroys those which were written with burnt Cork in Water, and which were before very legible. These are the famous sympathetic Inks, the Method of using them is to write with a Solution of Lead, or of Sugar of Lead in Vinegar; when this is dry nothing appears; over this is to be written some different Sentence with the black Ink made of burnt Cork and Gum-Water, and over this when dry is to be rubb'd a Piece of Cotton wetted with the Lixivium of Lime and Orpiment; the Sentence that was legible will then disappear, and the invisible one before written with the Solution of Lead will be seen in its Place, very black and strong.

CHAPTER VI.

S A N D A R A C H A,
Sandarach.

THIS is a very beautiful native Fossil, though too often confounded by Authors as well as by our Druggists with the common factitious red Arsenic, and with the red Matter form'd by melting the common yellow Orpiment. The first of these is a very terrible Error, as it confounds a safe and harmless Medicine with a horrible Poison: The latter is of a less pernicious Nature, as the Sandarach is truly of the Nature of the Orpiments, and not only much resembles the Mass produced by Fire from common Orpiment, but very possibly may be, tho' native in regard to us, a Fossil form'd within the Earth from Orpiment, by means of a similar Process by the subterranean Fires.

It is a pure and elegant Substance, of a very even and regular Structure, moderately hard and very remarkably heavy. It is naturally of a tollerably smooth and somewhat glossy Surface, soft to the Touch, and is found in loose Masses lodg'd among the Ore in the Veins of Copper and in some other Mines. These Masses are of no determinate Shape or Size; they are indeed usually flatted and have rude and irregular Edges; they are met with from an Ounce or less to ten or even twenty Pound in Weight. The most frequent are however from the Size of a Walnut to that of a Man's Fist. It requires a considerably hard Blow to break it, and when broken is seen to be of a simple Structure, not plated or flakey as the Orpiments, but solid and even as a Flint. It is throughout of a very glorious red Colour, superior to that of the purest Cinnabar, as it is brighter and has something of the yellowish Tinge among it that is wanting in that Fossil; it is indeed exactly of that Colour which our Dyers express by the Name of an Orange Scarlet; but though superior to Cinnabar in the Mass, in this Respect, it is vastly inferior to it when both are reduced to Powder. It is considerably transparent even in the thickest Pieces.

Exposed to a moderate Heat it melts and flows thin like Oil, and if set on Fire it burns very briskly with a bright white Flame with somewhat of a greenish Tinge mix'd with it, it emits the same garlick-like Smell that common Orpiment does, and sends up a copious thick white Smoak. If it be

lighted again and again as it goes out it will finally burn all away without leaving the least Remainder.

It is found in *Saxony* and *Bohemia* in the Copper and Silver Mines, and is sold to the Painters who find it a very fine and valuable Red.

The Ancients knew it very well under this Name of Sandarach, and *Theophrastus*, and all the other *Greeks* of Antiquity, have recorded it among the things used by the Painters of their Time: In the Shops it has been a long Time known under the Names of *Realgar* and *Risagallum*, and among the *Arabians* under that of *Zarnich Abmer*. All these Names have however been attributed also to the factitious red Arsenic which People have confounded with it.

The Virtues or Qualities of this Drug are no more ascertained at this Time than those of the yellow Orpiment. *Geoffroy* indeed tells us it is poisonous, but he says the same without Foundation of Orpiment. It is true that *Dioscorides* has rank'd it among the corrosive Substances, but he has also prescribed it internally in almost all the Diseases of the Breast, and *Hippocrates* bears him Company in it. They gave it sometimes in Powder, sometimes in Linctus's, and sometimes in Vapour, ordering the Fume of it to be received into the Throat: *Hippocrates's* Method of giving it was in Mixture with an equal Quantity of native Sulphur, and three or four blanch'd Almonds. He gave not less than the Obolus, that is about twelve Grains of our Weight, in this Manner at a Dose, and we do not hear of any ill Effect from it.

The *Chinese* make Images of their Pagods of it, and cast it into Cups which they infuse Wine in, as we used to do in Antimonial ones, and afterwards give it as a Medicine in many Diseases. It has been affirmed that the same Thing has been try'd here, but with very bad Success, the Wine acquiring little less than a poisonous Quality from the Infusion. It has been guess'd from this that the People in hot Countries where Perspiration is very free, bear Doses that wou'd prove fatal here; but is it not more probable that the common Mistake was made in these Trials, and that red Arsenic instead of native Sandarach was used as the Ingredient? We have no Necessity of making a Trial of it in Medicine, as we have many Things sufficiently efficacious for all the Purposes it is recommended in, the Safety of which we are perfectly well assur'd of: But it may be added here to the Accounts of the Ancients, that I have given it in no less Quantity than a Dram to a Dog, without Hurt. Were there however no other Reasons against the bringing this and the yellow Orpiment into Use in Medicine, the common Error of confounding them with the red and yellow factitious Arsenic wou'd be sufficient, at least till it should be better clear'd up, than it is at present, to the Generality of the World.

The yellow Orpiment is indeed easily distinguished from the Arsenic of that Colour, by its being of a plated Texture, whereas the other is not, but the Difference between Sandarach and red Arsenic is much less obvious: The only Means of distinguishing them at Sight is, that the Arsenic is of a deeper Colour, and has nothing of the yellowish or orange Cast of the Sandarach.

Inflammabilia

Inflammable Fossils which are solid and opake.

CHAPTER I.

AMBRAGRISEA,
Ambergrease.

THIS is a bituminous Mineral, about the Origin of which there has been as much Confusion and Error among the Writers on these Subjects, as about that of Amber. These Errors are however of much later Date than those relating to that Subject, for the Substance that has given rise to them was not at all known amongst the ancient *Greeks*; the earliest Mention we any where find of it being in *Aëtius*: Since the Time of that Author we meet with some who have asserted it to be the Exsudation of a Tree; others who have declared it to be of the animal Kingdom, and according to the Custom of the World, in obscure Cases, to allow least of all to the true Opinion, scarce any are to be met with who guess'd of its being of mineral Origin.

By those who esteemed it a vegetable Juice, several Trees have been adjudg'd to the producing it, and have been supposed to grow on the Sea-Coast, and either to drop it from their Trunks and Branches into the Water, or to exsude it from their Roots which ran out of the Earth into that Fluid. Among those who will have it of animal Origin, some have supposed it form'd by some unknown Process from Honeycombs, others have imagined the Dung of Birds to give it its first Matter, and others have very circumstantially recorded its being produced in the Body of the Whale. All these Opinions however are equally false.

Ambergrease is a true and genuine mineral Production, of the Number of the Bitumens, and answering to the Characteristics of all the other Fossils of that Kind. It is a light and frothy Substance which originally bubbles up out of the Earth in a fluid Form, principally under Water, where it is by Degrees wash'd about and hardened into the Masses we see it in. We have the same Proof of its having been once soft, that we have of Amber's having been so, that is we find extraneous Bodies bedded in it: Pieces of Honeycomb have been sometimes found in it, and thence has arisen the Error that the whole was once Honeycomb; what it generally contains of this Kind are however such Substances as it might naturally be supposed to meet with as it has roll'd about in the Sea; we do not except out of this Number even the Beaks which are generally said to be those of Perroquets, but which are in Truth those of a Species of the Calamary.

Ambergrease in its hard or common Form is a lax and coarse Substance of an irregular Structure, friable and so light as to swim upon Water. It is soft and unctuous to the Touch of a highly perfum'd Smell, and is found in Masses of a perfectly irregular Figure, generally of very rough and uneven Surfaces, and from Pieces of the Bigness of a Pea, to Masses of ten, twenty, or more

Pounds.

Pounds ; nay, there have some been found of more than two hundred Weight. The most usual Standard however is from a quarter to half a Pound.

It is not in the least bright or transparent, and when pure it is of a pale grey Colour with a faint tinge of brown in it ; but Pieces perfectly and uniformly of this Colour are rare, what we usually meet with is composed of whitish, yellowish and blackish Granules ; as there is more of this whitish Matter in these Masses they are the more scented and valuable, but it is apt to wash off from the smaller Masses and from the Surfaces of the larger, so as to leave them less valuable : The yellowish will also sometimes be carried off and leave only the black behind, this makes what they call black Ambergrease, and what some have esteem'd a peculiar Kind of this Bitumen, but very erroneously. This may well be the worst Kind of Ambergrease, since it is in Truth only the Remainder after all the finer Matter is wash'd off.

Ambergrease is not soluble in any Acid, nor makes the least Effervescence with any. It very freely and readily melts over the Fire, running into a fluid Substance as thin as Water. It readily takes Fire also in the manner of the other Bitumens, and burns with a very bright whitish Flame ; when pure it will thus burn almost entirely away, leaving very little Remainder. Spirit of Wine is the best Solvent we know for it, but this does not take up its whole Substance, but always leaves a Remainder in Form of a black pitchy or bituminous Matter ; and even what is at first taken up by this Menstruum is not all retained by it, a large Portion of it usually subsiding in Form of a white Cloud towards the Bottom of the Vessel afterwards ; this by Degrees coagulates more and more, and finally may be reduced by the Evaporation of all the Menstruum to a dry flaky or foliated Earth, of a whitish Colour and very fatty to the Touch.

On Analysis it first yields by Distillation in a Retort a Quantity of insipid Phlegm, then comes over an acid Spirit and a very highly scented yellowish Oil, with a small Portion of an acid Salt like that which is produced from Amber, and there remains at the Bottom of the Retort a black shining bituminous Matter, not unlike that which is left after a like Distillation of Amber, and which in the same manner as that, may itself also be raised in a very fierce Heat.

It appears from this that Ambergrease in many of its Characters approaches greatly to Amber. It is to be chosen in clean and not over friable Pieces, of a pale grey Colour and as uniform as may be in its Structure, or with small, not very large, black Specks within. It is found on the Sea-Coasts in many Parts of the World, indeed at one Time or other it has been met with almost on all. The greatest Quantity we have of it at present is from *Africa* : The *East-Indies* in many Places afford it at Times, and it has been met with in many Parts of *America*. It is no wonder indeed that so light a Substance as this produced in the deep Seas, as it probably is, should be carried to almost any Coasts by the Course of the Wind. We have sometimes had very considerable Masses of it found in *Scotland*.

The oldest Authors that treat of Ambergrease call it *Ambar* or *Ampar*, but it afterwards became necessary to add an Epithet to this Word and call it *Ambragrisea* and *Ambra Cinericea*, from the Confusion brought into the Shops by *Avicenna* and some others of the *Arabians*, who call'd the common Amber or *Succinum* by the same Name *Ambra*.

It is a very high Cordial, and when the Constitution will bear it, (for some Persons cannot suffer the least Particle of it to come near them,) is found of great Use in Convulsions and in all nervous Disorders. It is also esteem'd one of the greatest Provocatives to Venery that the *Materia Medica* affords us: And in the Eastern Parts of the World, where it is frequent, it is generally esteem'd one of those Medicines by which Life may be prolong'd. Its Dose is from one Grain to six or eight. The only Preparation of Ambergrease in Use at present is its Tincture or Essence.

TINCTURA AMBRAGRISAE,
Tincture or Essence of Ambergrease.

Take Ambergrease and white Sugar-Candy, of each two Drams; Musk, twelve Grains; Civit, two Grains; grind all these well together in a Glass-Mortar, and add to them by slow Degrees four Ounces of rectify'd Spirit of Wine; set the whole in a tall Glass in a mild Sand-heat for four Days and then separate the clear Tincture or Essence for Use. The Dose of this is from one to eight or ten Drops, and it has all the Virtues of the Ambergrease in Substance.

C H A P T E R II.

BITUMEN JUDAICUM,
Jews Pitch.

THIS is a natural Bitumen of the solid Kind, but less firm and hard than most of the former. It is of a very close and compact Texture and remarkably light: It is found in Masses of very irregular Figures, though usually approaching something to a round or oval Form and generally flatted; the Surface of these is usually rough and uneven and often wrinkled and corrugated. It is of a bituminous and sub-acid Taste and has a disagreeable Smell, especially when brought to the Fire, tho' it has less of this than any of the fluid Kinds. The Masses of it are in general from an Ounce to two or three Pound in Weight, they are of a dusky, greyish, or brownish black on the outside, but when broken they are almost of as deep a black as Jet, and of as smooth and glossy a Surface; it sometimes shews a number of small Cracks where it breaks, but it has nothing of the laminated Structure of the true Jet, nor is particularly determined like that to split in a horizontal rather than in any other Direction: when broke into thin Pieces and held up against a strong Light it appears somewhat transparent and of a redish yellow or deep orange Colour. It does not ferment with any Acids, it very readily melts in a small Degree of Heat, but does not flow equally and thin, but rises up in Bubbles. It readily takes Fire and burns with a greenish white Flame, and this may be rekindled again and again as it goes out, till at length the whole bituminous Matter will be burnt away, and only a small Quantity of white Ashes will remain.

The true *Bitumen Judaicum*, distilled in a Retort in a Sand-heat gradually increased, affords first a whitish Phlegm of a disagreeable bitterish and sub-acid Taste, after this there rises a clear and thin Oil of a dusky red Colour, and after this a thicker Oil like Butter and almost black; if the Fire be urged to a greater Degree after this, the greatest Part of the Remainder will be raised and come over in Form of a thick natural Bitumen, nothing remaining but a small Quantity of a spongy Mass resembling a light well burnt Cinder. This

This is the Bitumen which the ancient *Greeks* have described to us under the Name of *Asphaltum*. *Dioscorides* indeed has puzzled the Matter a little by telling us that the best *Asphaltum* was purplish, but probably all that he meant by that, was that it had some such Tinge when held up against the Light in thin Pieces. *Serapio* has described it under the Name of *Karabe Sadoimæ*, and *Gummi funerum*, *Karabe* being properly among the *Arabians* a Name for any Bitumen, and the other Part of the Name expressing the Place whence it came; its other Name among these Authors was given it from its Use in embalming.

It is emollient and discutient, and is said to be a powerful Emmenagogue, but at present we scarce hear of it in Prescription, or find it genuine in the Shops; what we generally meet with under its Name is a coarse Bitumen found in many Parts of *Germany*; and sometimes the *Caput Mortuum* of the Distillation of Amber is offered to Sale under its Name.

The true *Bitumen Judaicum* is brought to us from *Ægypt*, where it is found in many Places on the Surface of the Earth or at small Depths.

CHAPTER III.

GAGATES,

Jet.

THE Gagates or true Jet is a Substance that has been long known to the World, both as a thing useful in Medicine, and as a beautiful Fossil for Toys and Ornaments of several Kinds; yet so very imperfectly have People been all this while acquainted with it, that even in *England*, where the finest in the World is produced, it is so little known, that it is generally confounded with the common Ampelites or Cannel Coal. The Difference however between these is very plain both in their Nature and Origin. The Cannel Coal forms whole Strata in the Earth and those of vast Thickness and Extent. The Jet on the other Hand is found in detached Masses, seldom of any great Size, lodged in the Strata of Clay and other Matter. Jet has a Grain resembling that of Wood, and will split very easily and regularly in an horizontal Direction, but breaks much more difficultly and more irregularly in any other Direction; the Cannel Coal breaks equally easy any way, and has no distinguishable Grain at all. Jet is but moderately hard, Cannel Coal is extremely so, not less indeed than many Stones; and finally Jet is the much more inflammable, it flames a long time, the Cannel Coal but a little while. After these distinguishing Characters of the two Substances so frequently confounded together, we come to the Description of Jet as thus distinguished. Jet is a very beautiful Fossil of a tolerably firm and very even and regular Structure, and generally of a smooth, sometimes of a glossy Surface; when broken it always appears very bright and shining; it is very light and of a bituminous and subastringent Taste. It is found in Masses usually so far determinate in Figure, that they are thick in the Middle and thin at the Edges; they are sometimes rounded, but more frequently of an oblong Figure, and resembling a Board that had been left thick in the Middle, and cut away toward the Sides. These Pieces are what are called the Ribs of Jet; they do indeed in some Measure resemble Ribs, but that

that they are not crooked. The larger Masses of Jet are usually of one of these two Figures, but the smaller are found of all the irregular Shapes imaginable; they often look like Fragments of larger Masses, and sometimes where they have been washed about upon the Shores resemble Pebbles by their rounded Figure and smooth Surface. Its largest Masses are usually of the oblong Form above mentioned, these are often two or three Feet long, sometimes a considerable deal more, and some of them are six or eight Inches thick in the Middle, but these largest Pieces are seldom good throughout.

It is of a fine deep black Colour very glossy and shining, except upon its Surface where it has been fould by Accidents; it usually exhibits a Texture or Grain resembling that of Wood, and when examined by the Microscope is found to be composed of a Number of parallel Plates very thin and laid closely upon one another.

Hartman, who has treated very largely of the *Prussian* Amber, describes a Substance which he calls the Matrix of Amber, and which he says resembles fossil Wood; this is evidently a coarse and imperfect Kind of Jet, and therefore the Opinion of Amber's being originally a vegetable Resin founded on its being found in the Veins, and among the Strata of this Matter falls to the Ground, as this Matrix itself is not a vegetable, but a Fossil, and that of the bituminous Kind like the other.

Jet is not soluble in any of the Acids, nor does it make any Effervescence with them. It is not fusible by Fire but it is inflammable, and yields a very bright white Flame which continues a long time, and may be renewed again and again by holding it to a Candle, till the whole Substance of the Jet burns away, leaving only a small Quantity of Ashes of a saline Taste.

Jet is to be chosen of the deepest black of a moderate Hardness, very light and such as will split most evenly in an horizontal Direction; for this is its great distinguishing Character from the Cannel Coal, and from the hard *Bitumen Judaicum*.

It is found in many Parts of the World: the *German* Mines afford large Quantities of it; it is also frequent on the Coasts of *France* and *Italy*, washed up by the Sea; we have it in *England* in great Abundance lodged in Strata of Stone and Clay, and often washed out of Cliffs and rolled about the Shores by the Waves.

Jet has been known from the earliest Times we have any Account of: the ancient *Greeks* call it *Gagates*, the more modern Writers in that Language *Engangis* and *Gangitis*, the *Latins* *Gagates*, and sometimes, tho' very improperly, *Succinum nigrum*, black Amber; for there is a real black Amber easily distinguishable from this by its superior Hardness in the Mass, and by its readily melting over the Fire which the Jet will not do.

True Jet distilled in a Retort in a Sand-Heat, with the Fire gradually raised, affords first a whitish, acrid, and sub-acid Phlegm, after this there rises a thin, dusky or blackish Oil, and afterwards a coarser and thicker Oil of the same Colour. There is not the least Appearance of any Salt resembling that of Amber procured by the Process in a dry Form; but if the Phlegm be carefully evaporated and set to shoot, there will be found small Concretions of a grey Salt somewhat like that of Amber about the Sides of the Vessel. This Salt is yielded in so very small Quantity by Jet, that half a Pound of it scarce will afford a Scruple, whatever Care be taken to separate it

it from the Water. It is singular that this Salt is more acid than that of Amber and yet is more volatile, rising much earlier than that in the Process. The *Caput Mortuum* left in the Retort after the Distillation of Jet is much larger in Quantity, in Proportion, than that left after distilling Amber. A Pound of Amber leaves but about ten Drams of it, eight Ounces of Jet will leave two Ounces and a half, and this is much more loose and spongy than that left by Amber.

The Ancients have left us great Praises of Jet as a Medicine, but the later Practice has not been at the Pains to know whether justly or not. *Dioscorides* tells us that it is an excellent Emollient and Discutient; he recommends a Fumigation of it for Diseases of the Womb, and Water in which burning Jet has been quenched as a Cardiac. *Aëtius* orders it to be extinguished in Wine for the same Purpose.

Its thin Oil much resembles that of Amber and might be used to the same Purposes.

CHAPTER IV.

AMPELITES, Cannel Coal.

THIS is a Substance which has a long time, tho' with very little Reason, been confounded both by Authors and by our Druggists with Jet; how improperly we have shewn in the preceding Chapter, where the distinguishing Characters of each are also delivered. The Ampelites is the hardest of all the bituminous Fossils. It is found in large Strata and is of an extremely Compact and even Structure, and has no visible Grain as the Jet has; it is very light and is naturally of a smooth and somewhat glossy Surface, and of a pure and unmixed black Colour, tho' it is much less glossy than the Jet, and of a less deep black than it. The Strata it forms are sometimes crack'd perpendicularly with small Fissures, and these are usually in time filled up with a white Spar; this Matter makes a Sort of white Veins in the Ampelites in this Case, and it is owing only to this Accident that some Authors have described this Fossil as being sometimes variegated with white. It is not fusible, but very readily takes Fire and burns a little while with a bright white Flame, after which it becomes red hot and continues so a long time, till in fine it leaves only a small Quantity of whitish Ashes.

It is dug in many Parts of *England* in great Abundance, particularly in *Lancashire*, where it is burnt as common Fuel, and makes an extremely sweet and cleanly Fire, casting a great Heat, and consuming but very slowly.

Among the Authors who have treated of this Substance, we find some who have given it the Name of black Amber, *Succinum Nigrum*, confounding it in their own Thoughts with Jet, and that by a double Blunder with the black Amber. Some also have imagined it the *Lapis Obsidianus* of the Ancients, and described it under that Name.

It is often work'd into Toys and Utensils of various Kinds, under the Name of Jet, and is sometimes sold at a considerable Price by that Fallacy. In Medicine it has the Credit of being good in the Cholic, and of being in general an Emollient and Discutient, but the present Practice takes no Notice of it.

Of the Liquid inflammable Fossils.

C H A P T E R I.

PETROLEUM,
Rock Oil, or Oil of Petre.

THIS is the most frequent of all the liquid Bitumens, and is perhaps the most valuable of them all in Medicine. It is an extremely subtle and penetrating Fluid; and is by much the thinnest of all the native Bitumens, approaching in its Consistence, its Smell, and many of its Qualities, to the distilled essential Oils of Plants. It is very light and very pellucid, but tho' equally bright and clear under all Circumstances; and it is liable to very great Variety in its Colour. It is naturally almost colourless, and much resembles the most pure Oil of Turpentine in Appearance; this is called, tho' somewhat improperly, white *Petroleum*, for it has no more Colour than fair Water; it is sometimes tinged to a brownish, yellowish, or reddish Colour, and sometimes to a faint greenish. Its most frequent Colour however is a Mixture of the reddish and blackish, in such a Degree that it looks black when viewed behind the Light, but Purple when placed between the Eye and a Candle or a Window.

The white, as it is called, is most of all esteemed, but there is not much Reason for this, the other Kinds are so lightly tinged that they lose very little of their Pellucidity by it; and they are all of the same pungent and acrid Taste, and of the same strong and penetrating Smell, which very much approaches to that of the distilled Oil of Amber.

It is very inflammable taking Fire at the Approach of a Candle, and burning almost wholly away, when it floats on the Surface of the Water, as it does in many Parts of *Italy*; it is easy by this means to set the Surface of a whole Pond on Fire in an Instant, and give the Appearance of Water burning. It is not in many Places necessary to touch the Surface of the Oil on this Occasion with the Fire, for the *Petroleum* continually sending up a large Quantity of Vapours, they will often take Fire if a lighted Candle is brought within a Foot or two of the Oil itself.

Petroleum distilled by the Retort affords a thin and fluid Oil, somewhat more transparent and pure than it was before Distillation, but a great Part of its subtle Spirit is lost in the Operation; for this Oil is of a less penetrating Smell, and is less inflammable than the native Matter; the Remainder in the Bottom of the Vessel is a thick yellowish Matter looking like melted Refin. This Bitumen is therefore better for all medicinal Purposes in its native State than thus distilled; when intended to be burnt in Lamps it is indeed the better for Distillation, as it then burns away less quick, and has less Smell, and makes less Smoak.

Petroleum is found in many Parts of the World, but no where so plentifully as in *Italy*, they sink Wells in many Places for it, where at thirty or forty Feet

Feet deep they find it rise in vast Abundance with the Water. It is also found trickling of itself down the Sides of Hills along with the little Streams of Water, and is generally found least coloured toward the Top of the Hill, and more and more ting'd as it is found nearer the Bottom, till at length it is quite black. There are also Places in *Italy*, where Springs carrying large Quantities of *Petroleum* run on the Surface and sometimes lose themselves, and rise again several times in a small Extent of Ground; the *Petroleum* swimming on these, shews how very easily that Fluid takes up its several Colours, for it will be seen white or colourless in one Place, and brownish in another of fifty Yards Distance, and a little farther quite black, tho' it has been only carried a little way under the Surface of the Earth, between one and the other of these Places. Some of these Springs yield such Plenty of the *Petroleum* on their Surface, that many Gallons of it are weekly skim'd off by the Inhabitants of the neighbouring Places, and sold at a very moderate Price. It is also frequent in many Parts of *Germany*, and in *France*, where they have enough of it to make a Traffic with it; we are not without it in *England*, but we do not make any Use of it.

Petroleum is to be chosen the purest, lightest, and most pellucid that can be had, such as is of the most penetrating Smell, and is the most inflammable: we very frequently meet with the distilled Oils of the other Bitumens under its Name, but these are none of them of so brisk or pungent a Smell, or so inflammable as the genuine Kind.

It is principally used externally in Paralytic Cases, and in Pains of the Limbs. The *French* give it internally in Hysteric Complaints, and to their Children against Worms; some also give it from ten to fifteen Drops in Wine for Suppressions of the Menfes. These however are rather the Practices of the common People than of the Faculty.

CHAPTER II.

NAPHTHA.

THIS is a mineral Fluid too much confounded with the Petroleum by Authors, it being the general Account that a yellowish Petroleum is Naphtha, and many even giving this Name to the common pure State of that Fluid in which it is colourless like Water: Naphtha however is a very different Thing from Petroleum of any Kind.

It is a very pure, clear and thin mineral Fluid, though much less so than the Petroleum. It is in Consistence much thinner than the express'd vegetable Oils, but something thicker than the thin and fine distill'd ones. It is perfectly clear and transparent, and in Colour is not white as has been generally reported, but of a very pale Yellow with a Cast of Brown in it. It is soft and oily to the Touch, and almost immediately dries away upon the Fingers: It is of a sharp and unpleasant Taste, and of a very brisk and penetrating Smell, though much less so than the common Petroleum. What Scent it has is truly of the bituminous Kind, and approaches to that of the distill'd Oil of Amber, but is very faint in Comparison of that. It is extremely ready to take Fire, and will, when pure, burn wholly away without leaving the least Remainder; and in Places where

where it is frequent, it exhales a Vapour that takes Fire at the Approach of any Flame and burns to a great Distance, sometimes spreading in an instant over half a Mile or more of Ground, and continuing alight a great while.

It is found floating on the Waters of Springs which issue out at the Sides of Hills in *Persia*, *Tartary*, and many other of the Eastern Parts of the World. It is not known to be produced any where in *Europe*. Distill'd by the Retort it yields an Oil somewhat thinner than it was originally, and of a weaker Smell. The Substance remaining at the Bottom of the Retort has much the Resemblance of Amber: And it seems highly probable that the Origin of all the Amber in the World is from the same Sort of Principle. I have succeeded so far in an Attempt to make Amber by this Fluid, and an Acid drawn from the crude Pyrites, that I have produced a friable somewhat pellucid Matter, having all the Properties of Amber, except its Hardness and Clearness, and yielding a true Salt and Oil of Amber on Distillation: But as melted Amber never will be perfect fine Amber again, and as it is impossible to finish this Process without running the Matter into Fusion, I frankly confess that I have Doubts whether it may ever be carried any farther.

The medicinal Virtues of the Naphtha are the same with those of the common Petroleum, but in a more remiss Degree. It is used externally on many Occasions in *Persia*, where it is produced in the greatest Plenty, and is taken inwardly, a few Drops for a Dose, in Cholics. The principal Use that is made of it however is for burning in Lamps, for which Purpose, it is very proper as it does not burn away so quick as the Petroleum, and is of a less offensive Smell, but it has the Disadvantage of making more Smoak. The Ancients call'd it *Oleum Medee*, and have recorded very strange Things of its inflammable Quality. We are told that about *Babylon*, where it was produced in great Abundance, there was a blackish Kind as well as this yellowish one; but as we do not meet with or hear of any but the pure Yellow at this Time, it is highly probable that what was call'd at that Time black Naphtha was the dark Petroleum.

CHAPTER III.

PISSASPHALTUM, *Earth Pitch.*

THIS is a Substance very little known in the Shops in its genuine State, though its Name is frequent enough: What is generally met with under this Appellation being a Mixture of common Pitch and the *Bitumen Judaicum*. This differs from the true simple Asphaltum, or *Bitumen Judaicum*, under the Name of which it is sometimes also sold, in its being of a less deep Black, more soft and friable, and of a very disagreeable Smell.

Such is the artificial *Pissasphaltum*, the genuine Substance of this Name is of the Number of the liquid Bitumens, but is by much the thickest of them all. It is a tough, ropy, viscid Matter, approaching to the Consistence of Bird-Lime when fit for Use. It is of a dusky black Colour when view'd in the Mass, but when extended into thin Flakes and view'd against the Light it appears of a deep purplish orange Colour; upon the whole it resembles nothing so much as common Pitch when a little softened by the Fire. It is of a considerably
strong

strong bituminous Smell, but a much less disagreeable one than the other liquid Bitumens, something like the Fragrance of Amber when heated by rubbing, making a considerable Part in it: We are told indeed by Authors of its having much of the Smell of common Pitch, but probably those who tell us so have form'd their Account of it from adulterated Specimens, in which common Pitch made the greatest Part; for there is assuredly nothing of the Nature of this Smell in the genuine *Pissasphaltum*. It is soft enough to run and spread upon a Marble when fresh, but by Degrees it becomes more and more hard, tho' it never will arrive at the Consistence of the solid Bitumens. It makes no Effervescence with acid Menstruums, but it is soluble in Oil, and will impart a Tincture to Spirit of Wine, and will give a strong Taste to Water. Held over a gentle Heat it grows thin and very soon boils, but it does not melt equally into an uniform Mass, but swells up and bubbles very much: It very readily takes Fire and burns with a bright white Flame, leaving behind it a small Quantity of whitish Ashes. Mix'd with powder'd Bole, or Chalk, and distill'd by the Retort, it yields a whitish bitter subacid and very disagreeable Water, and afterwards a thin fine Oil of a dark Colour, very like the Petroleum, and after this a thicker and stronger scented one.

It is found ouzing out of Rocks, or out of the Surface of the Earth, in several Parts of the World. The *East-Indies*, *Persia* and *Ægypt* abound with it in several Places, but it is no where so plentiful as in *Italy*, where it rises up out of the Surface of the Ground, especially in hot Weather, in many Places, and in such Quantities that its Viscidity makes it a very disagreeable Thing to pass over them: They collect it principally there for Use. The greatest Quantity of what they gather is distill'd for its thin Oil, which is sent into other Parts of *Europe* under the Name of Petroleum; the rest is sent to the *German* Shops who generally keep it in its natural State. The greatest Quantity any where known of it is about *Castro*, a Town about sixty Miles from *Rome*, where the finest, and what is usually preserved in its natural State, is such as is found ouzing out of the Cracks of the neighbouring Rocks, and is commonly call'd *Pece de Castro*, *Castro Pitch*.

The Ancients call'd it *Pittasphaltum* or *Pissasphaltum*, and the Moderns *Pix Mineralis*, and some of them *Maltha*, but this Name does not so properly belong to the *Bitumen* alone, and to a Mixture of it with Clay and Sand, in which Case it makes a very tenacious Kind of Mortar, or Cement for building, and seems to have been the famous Cement used in building the Walls of *Babylon*.

It is much recommended by the Ancients for external Use, as an Emollient, Maturant and Digestive; and was used in Cataplasms for the ripening all Sorts of Tumors, and against the Sciatica, and other Pains of the Limbs. They also frequently had recourse to it to strengthen the Limbs after reducing of Dislocations. It is not much used at present, and indeed in most Cases in which it is recommended the Petroleum seems very proper to supply its Place.

CHAPTER IV.

PISSELEUM INDICUM,

Barbados Tar.

THIS is a mineral Fluid of the Nature of the thicker fluid Bitumens, and of all others the most approaching in Appearance, Colour and Consistence to the true *Pissasphaltum*, though differing from it in many other essential Points. It is a thick, heavy and dusky coloured Matter, viscid to the Touch, but much less so than the *Pissasphaltum*, and is about the Consistence of Treacle, but not of so uniform a Structure of Parts: When examin'd against the Light or pour'd from one Vessel to another, it is found to be of a brownish black Colour, but with nothing of the orange Cast of the *Pissasphaltum*, and it is less transparent though of a thinner Consistence. It is of a nauseous, acrid and bitterish Taste, and of a very strong and disagreeable Smell very like that of the Petroleum, with a Mixture of that of the distill'd Oil of Amber. It melts with a very small Degree of Heat into a thin Substance like Oil, which when cold is found thicker and tougher than it was originally. It is naturally thinner in warm Weather than in cold, and it grows less fluid as it is longer kept. It very readily takes Fire and burns with a brisk vivid white Flame, with a Mixture of a pale greenish Cast in it, and with a very disagreeable Smell, and finally leaves a large Quantity of an unflammable Earth behind it, in Form of whitish or greyish Ashes. It is soluble in Oil or any fatty Substance, and it gives a very disagreeable Taste to Water. Distill'd in a Retort with a Sand-heat it affords a white, thick and very disagreeable Water of an acid and bitterish Taste, and afterwards a large Quantity of a dark colour'd thin Oil, of a very penetrating Scent not unlike that of Oil of Amber.

It is very frequent in many Parts of *America*, where it is found trickling down the Sides of the Mountains in large Quantities, and sometimes floating on the Surface of the Waters; but it seems to be almost lost at this Time in the Country from whence it was originally named, the *Island of Barbados*, scarce any where affording it. It has been greatly recommended internally, in Coughs and other Disorders of the Breast and Lungs, but it is very seldom to be met with genuine, either in *America* or with us: The People who collect it usually mixing other Things with it, and frequently giving very different Things under its Name.

CHAPTER V.

OLEUM TERRÆ,

Oil of the Earth.

THIS is another of the thicker mineral Fluids, or more properly it is of a middle Consistence between that of the thick ones here described and the thin ones before. It is of the Consistence of a thin Syrup in Winter, and in warm Weather is little thicker than Oil of Olives: It is of a dusky blackish Colour, and when held up against the Light is found to have a faint Cast of Purple in it, though without any thing of the yellowish or orange Cast

of the *Piffasphaltum*. It is but moderately transparent however for so thin a Fluid, and is of a very disagreeable Taste, and of a strong penetrating Smell like that of the distill'd Oil of Amber. It melts over a very gentle Heat into a thin Fluid like Oil but is not very clear, and by repeated Fusions of this Kind it may be brought to a much thicker Consistence than it naturally is of: It readily dissolves in Oil: It imparts a Tincture to Spirit of Wine, and gives a bitterish and acrid Taste to Water. It is very readily inflammable and burns with a white but not very brisk or vivid Flame, and leaves a large Remainder of an inflammable grey Earth behind it.

Distill'd by the Retort it in great Part rises in Form of a much thinner and more strongly scented Oil, and leaves behind it a black thick Matter much like the *Piffasphaltum*, but this urg'd by a stronger Fire will in great Part come over too in Form of a thick dark colour'd Balsam.

The true *Oleum Terræ* seems peculiar to the East, where it is call'd *Miniac Tannab*, which signifies Oil of the Earth. It is no where so plentifully produced as in the Island of *Sumatra*, where it ouzes out of the Cracks of Rocks in the Hills in many Places. The People of the *East-Indies* esteem it greatly in paralytic Disorders, using it externally as an Embrocation.

They have also another Oil of the same Name, but of a very different Nature; this last is what our *East-India* Surgeons usually bring over, and is a vegetable Oil impregnated with the Virtues of certain Earths and other mineral Substances which are heated red hot and quenched several Times in it, and some of them afterwards boil'd in it.



FOSSILE BODIES

Used in MEDICINE.

CLASS the SIXTH.

EARTHS.

AMONG the foffile Subftances used in Medicine, after the Metals, Semi-metals, Salts, Sulphurs and Bitumens, the Earths claim the next Place.

These, though they ferve the Physician to fewer Purpofes than the Bodies of either of the former Claffes, are more numerous than thofe of all of them together; they are much more liable to Sophiftication alfo; and greatly more difficult to be diftinguifhed from one another when genuine, as well as each from its feveral Counterfeits.

We underftand by the Word Earth, taken in the general, a Body not inflammable, opaque, infipid and friable when dry'd, ufually changing Colour in the Fire and hardening in it, always running into Glafs by the extream Force of it; not foluble in Water, eafily breaking, diffufing itfelf, and remaining fome Time fufpended in it, but always feparable from it by Subfidence, or by Filtration.

The Bodies included under this Definition are of five general Kinds, each known as well by the Mineralogifts as in the Shops, by its feveral generical Name. The five Genera of Earths are 1. BOLES. 2. CLAYS. 3. MARLS. 4. OCHRES. 5. TRIPELAS.

The far greater Number of the Subjects of the *Materia Medica*, which come under the Clafs of Earths, belong to the Bole Kind: Some Clays, and a few of the Marls are alfo occasionally received into Practice: As to the Earths of the two other Kinds, fome few of them ftand recommended by Authors for fome particular Purpofes, but they are feldom heard of in the modern Practice.

The five feveral Genera of Earths have their diftinct Characters, by which the Subjects belonging to each are eafily diftinguifhed from thofe of another.

The three firft Kinds are character'd by a fmooth Surface, a greater Softnefs and Unctuofity to the Touch, and a firmer Structure; the other two by their dufty Surface and more friable Texture.

The three former Genera are diftinguifhed from one another in that the Boles are lefs compact in their Structure than the Clays, but more fo than the Marls; the Clays are the longeft of all before they break, and diffufe themfelves in Water, and the Marls, which do this moft readily of all, have always the leaft of that Toughnefs and Vifciduity when moift, of which the Clays have

most of all. The two latter are very readily distinguishable in that the Ochres are composed of fine and soft Particles, the Tripelas often of equally fine but always hard ones.

Of BOLES.

WE would, according to the pre-established Distinctions, express by the Word *Bole* a simple native Earth, heavy, not very hard, smooth to the Touch, composed of fine Particles, which easily separate in Water, and remain a long Time suspended in that Fluid.

The Species of Bole principally used in Medicine may be divided, according to their Colour, into three Kinds. 1. The red. 2. The yellow, and 3. The white. To these may be added a brown Kind used in some Parts of *Germany*, but not known among us, nor received into the ordinary Catalogues of the *Materia Medica*.

Of the RED BOLES.

The red Boles in common Use in the Shops are three. 1. The *Red Armenian Bole*, to which, though there are two others of the same Country, a yellow and white one to be described in their proper Places, we generally give the appropriated Term *Bole Armenic*. 2. The red *French Bole* first introduced in that Country as a *Succedaneum* to the true *Armenian* red Bole, and sold under its Name; and 3. The *Red Bole of Lemnos*; to which we have, as to the red *Armenian* Kind, given the appropriated Term, *Lemnian Earth*, though there are also a yellow and a white Earth from the same Place.

Of the Number of the red Boles less frequently used, are 1. The *Terra Strigoniensis*, of a dull red, called sealed Earth of *Striga*. 2. The *Terra Livonica*, of a finer red, and more heavy. 3. The *Terra rubra magni Ducis*, or *Tuscan* sealed Earth, which is friable, and of a paler red. 4. The *Terra Portugallica*, of a stronger red than all, and 5. The *Terra Turcica*, of a pale greyish red.

Of the Red Boles in common Use in Medicine.

CHAPTER I.

BOLUS ARMENA RUBRA, *Red Bole Armenic.*

THE true red *Armenian Bole* is the hardest and firmest of all the medicinal Earths. It is usually brought to us in small Masses, which is owing to its being less tough and ductile while in the *Stratum* than the other Kinds. The more usual Pieces of it are from two Drams to an Ounce in Weight, and it is rare to meet with any of more than three or four Ounces. These are generally of a somewhat rough and rugged Surface, frequently covered with a light Dust, and never of the smooth and glossy Appearance of the other Kinds of Bole. They are sometimes of an even and regular Structure throughout, and sometimes composed of a Number of fine thin Layers, falling regularly over one another, like the Leaves of a Book.

It is considerably heavy, and of a bright and strong red Colour, with a slight Tinge of yellow, much approaching to that Colour in dying, which we call an Orange-Scarlet. It is generally a little paler on the Outside than within, and when wetted appears much darker than before. If applied to the Tongue it adheres very firmly to it, and is of a manifestly astringent Taste.

The finest Bole Armenic is that which is the hardest, of the highest Colour, and of the smoothest or least dusty Surface.

Though nothing is more common than the Name of this Drug in the Shops, nothing is more scarce than the genuine Substance there. Our Druggists might easily have it, and at a small Price from the *Levant*, but they will not be at the Trouble. They sell us many different Sophistications in its Place, which themselves know nothing of the Ingredients of, but which they purchase of People who make a Trade of preparing them. Some of these are made of common Whiting, others with the paler Clays, coloured with any red Earths: The most usual Counterfeit with us at present I have, by disuniting its Parts by means of Water, found to be a Mixture of common Tobacco-Pipe-Clay, coloured with red Ochre.

The Tests to try whether it be the genuine or fictitious are three. If genuine when put into the Fire, it becomes somewhat harder, and of a much darker Colour; when thrown into Acids, it raises no Effervescence with them; and when laid in Water, it is a long Time before it moulders to Pieces.

The red *Armenian* Bole has been known to the World from the earliest Times we have any Account of. The oldest Authors we have extant all mention it; but it was at that Time known only as a Colour used in painting and staining Things; they call it *Lemnian Reddle*, carefully distinguishing it from the medicinal Earth of the same Country, which they always call simply *Earth of Lemnos*. It was not till long after these Times, and then by Mistake, that it got into Use as a Medicine. *Galen* introduced an Earth into Practice under the Name of *Armenian* Bole;—this was the yellow Bole Armenic to be described hereafter: But the Knowledge of this being lost after a few Ages, the red Earth here described was erroneously substituted in its Place, and had all the Virtues of the true Bole of *Galen* ascribed to it. It was long after the Days of *Threophrastus*, who described this Earth under the Name of *Lemnian Reddle*, that *Galen* brought his yellow Bole into Use; and it was not till a great while after him, (for *Myrepsus* and others describe Bole Armenic as yellow) that this *Lemnian Reddle* of the old *Greeks* was introduced in its Stead. This seems to have been done about the Days of *Avicenna*, who is the oldest Author we know of, that describes Bole Armenic as red.

It is frequent in the *East* and *North-East* Parts of *Armenia*, and in the Island of *Lemnos*; but it lies deep in the last Place, and is only met with in sinking for the other Earths. In the Country from whence it takes its Name it lies in thick Strata, at four or five Feet Depth, and sometimes rises to the Surface.

The frequent Adulterations of Bole Armenic have almost robbed it of its Credit as a Medicine, and in a great Measure excluded it from extemporaneous Prescriptions; Physicians who would give an astringent Earth usually prescribing the red *French* Bole, or the yellow one of the same Country, called Bole of *Blois*. It is certain indeed, that much is not to be expected from a Mixture of Tobacco-Pipe-Clay and Ochre; but when this *Armenian* Earth is genuine,

guine, it is as much superior to the *French* Kinds, as they to the common Counterfeit. I have experienced it to be a noble Medicine in Diarrhœas, and even in Dysenteries, and in Hæmorrhages of all Kinds.

Its Dose is from five or six Grains to half a Dram. It may be given in Diarrhœas either singly, or with an equal Quantity of the common *Diascordium*. In Hæmorrhages it is usual to mix with it the *Peruvian* Bark, Dragon's Blood, or Alum. A Bolus of singular Use on these Occasions, is half a Dram of this Bole, fifteen Grains of Dragon's Blood, and ten of Alum, mixed with any of the astringent Syrups. Others give a Scruple of this Bole, with an equal Quantity of the Bark, repeating the Dose often, and with great Success.

It is used also externally in Contusions and Luxations : Mixed up with Vinegar, or with the beaten Whites of Eggs, into the Form of a Cataplasm, there is scarce any Thing that excells it on these Occasions.

It is an Ingredient in the *Diascordium* of *Fracastorius* in very considerable Quantity. It also enters the Composition of the *Venice* Treacle, as an Ingredient of some of the Troches, that make a Part in the Composition, and has a Place in many of the Electuaries, Powders and Troches of the Dispensatories of other Nations, intended as Cardiacs and Astringents, and in some of their Cerates and Plaisters.

On Analysis it is found to contain a small Quantity of Marine Salt, and a much larger of Iron. The Salt is rather to be discovered to exist in it by Experiments, than to be separated in any Quantity, but the Iron is so considerable that I have, by Means of a Flux-Powder, composed of the common white Flux, Charcoal, Sandiver, and powdered Glass, separated from an Ounce of true *Armenian* red Bole, twenty-six Grains of pure Iron.

CHAPTER II.

BOLUS RUBRA GALLICA, *Red French Bole.*

THIS is an Earth of considerable Value, though first brought into Use merely by the Fraud of the *French Druggists*, who finding it might be had near Home, got into a Way of adulterating the true *Armenian* Bole with it, and finally of selling it in its Place, and under its Name. If they have lost by this a much better Medicine, because it was less easy to be procured, they have, in Return, furnished all *Europe* since, with an Earth no Body would perhaps have been otherwise acquainted with ; and which is at least as much superior to the common Sophistications sold under the Name of Bole Armenic, as inferior to that Drug itself when genuine.

Our Physicians are so sensible of this, that they frequently prescribe this *French* Bole in the Place of Bole Armenic, though more frequently the *Bolus Blesensis* or Bole of *Blois*, a yellow Earth of the same Country, which comes nearer than any *European* Earth to the *Oriental* Boles.

The red or common *French* Bole is a moderately compact and firm Earth, of a smooth and glossy Surface, soft and unctuous to the Touch, and generally of a very irregular Structure, and of a mottled or variegated Appearance. Its
general

general Colour is a pale dead reddish, approaching to what we generally understand by the Term flesh Colour, only without its Brightness, but this is not its Colour throughout; for it is variegated with irregular Blotches, and sometimes with Veins of two other Earths, a yellowish and a whitish. The Matter of these Variegations is of a less dense and compact Texture, and is less astringent than the red, which is considerably heavy, and not so easily crumbled between the Fingers, though it has nothing like the Hardness of the red *Armenian* Bole. It scarce at all stains the Hands, it adheres pretty firmly to the Tongue, and has a manifest Astringency in its Taste.

It is usually brought to us in Masses of the Form of little Bricks, of four or five Ounces Weight, into which it is worked by the People who dig it. We sometimes have it indeed in the rough Lumps, as they fall from the Spade; but these are usually coarser and fuller of Sand, the Cakes having been washed to free it from that; though this is seldom so perfectly done, but that it leaves a Grittiness between the Teeth when chewed, though its earthy Matter melts very easily in the Mouth.

The finest red *French* Bole is that which is heaviest, most uniform in its Structure, with the fewest yellow or white Spots in it, the freest from Grittiness in the Mouth, and of the most astringent Taste. Our Druggists have not yet found any plausible Way of sophisticating this Earth; but if any should be offered, that looks suspicious, the Tests of its being genuine are these. Thrown into Water it breaks, and diffuses slowly, the yellow Parts breaking first, then the white, and the red last of all. It raises a slight Effervescence with Acids, and suffers very little Change in burning in a common Fire.

It seems to have been within this hundred and fifty Years, that this Earth has been known to the World; yet so universally had it got into Use in the Time of *Pomet*, that though a Man who had traded very largely in Drugs many Years, he acknowledges that he never saw a Piece of *Oriental* Bole of any Kind in his Life.

It is found in the Neighbourhood of *Baville*, and in many other Places about *Paris*, where it lies in Strata of considerable Thickness, at the Depth of four or five Feet. The Peasants who dig it are the People who wash and prepare it for the Druggists, and they commonly do it in a very slovenly Manner. Sometimes however one meets with Cakes of it of a uniform Colour, a paler red than the common ones, and with no Sand remaining in them, but wholly melting like Butter in the Mouth. This, when to be had, is preferable to any other; but it is not twice in an Age that one sees it.

Its Virtues are in general the same with those of the true Bole *Armenic*; but it possesses them in a more remiss Degree. It is found to be an Astringent, and to be of Service in Diarrhoeas, and in Hæmorrhages of all Kinds; the *French* give it in large Doses in Cases of Gleets and feminal Weaknesses, and in Catarrhs. It is observable that it is in some Degree an Alkali, which neither the true *Armenian* Bole, nor the common modern Counterfeits of it are.

If the Parts of this Earth be carefully disunited by Water, it will be found to consist of three several Matters of different specific Gravities; the red Part subsiding first, the whitish next, and the yellow remaining longest of all suspended in the Water; there generally falls also a Quantity of a whitish Sand.

Sand to the Bottom of the Vessel, and this in larger or smaller Quantity as the Mass has been delivered purer or fouler from the Diggers. There requires a tall and clear Glass to make this Experiment, and an attentive Eye to mark the Process of it. We are not to suppose that every Particle of the red Earth falls before a Grain of the whitish, or that every Grain of that is sent down before the yellow begins to settle; but a careful Observer will easily see the Proof of their different Gravities, both in the Time of subsiding, and in the Sediment itself.

It is remarkable that no Iron is to be separated from this Earth by the common Fluxes; though we may bring Particles of the ferrugineous Kind so nearly together in it, that a few Grains of it shall turn a Pint of an Infusion of Galls into Ink.

CHAPTER III.

TERRA LEMNIA RUBRA,
Red Lemnian Earth.

THIS is an Earth truly of the Bole Kind, but extremely different from the Boles of all other Parts of the World, and probably is the greatest Medicine of them all: We have the Testimony of Antiquity strongly for this, and it is our own Fault that it has not been fairly tried, whether what has been reported of it be or be not true.

It is of a moderately compact and firm Texture, but less hard than the true *Armenian* or even than the genuine red *French Bole*. It is sometimes brought to us in rough Masses of four Ounces or more in Weight, but more usually made up into little regular Lumps of the Form of a Segment of a Cone, and sealed with the Impression of a Crescent, Stars, and other Figures.

These however are so frequently counterfeited, that the crude Masses, as dug out of the Earth, are always to be preferred, if they may be had. It is of a smooth Surface, though less glossy and less unctuous to the Touch than the *French Bole*, of a regular and even Structure in all its Parts, very heavy, and of a pale reddish Colour, not approaching however to flesh Colour, but rather to that of a half burnt Brick. It is generally somewhat redder on the Surface than within, and is apt to discolour the Hands. Applied to the Tongue it adheres very firmly to it, and has a manifest Astringency in its Taste; beside which, a nice Palate will always distinguish also a sub-acrid and bituminous Flavour, which no other native Earth that we are acquainted with has any Thing of.

The best red *Lemnian Earth* is that which is most ponderous, and most easily crumbled to Pieces between the Fingers; and that which melts most readily in the Mouth has the most disagreeable Taste, and contains the least sandy Matter, or, in other Words, feels least gritty between the Teeth: it is never brought to us quite pure from Sand; but that which has least of it is always to be preferred, and it would be very proper for every Body who intends to use it, first to purify it perfectly from this foreign Matter by washing.

It is liable to many Adulterations. We have seen the red *French Bole* clean washed, and sometimes the common counterfeit Bole *Armenic* made into little Lumps,

Lumps, and sealed with a Crescent sold for it ; nay one of our eminent Drug-gifts is now possessed of a large Quantity of something under its Name, which I have proved by decomposing it, by Means of Water, to be no other than a Mixture of Pipe-Clay and Brickduft, and the colouring Ingredient not very finely powdered.

The Tests to prove whether it be genuine are these. Throw it into Water, and if it be true it breaks but very slowly, the sophisticated Kinds on the contrary generally break almost instantaneously in the same Fluid: Or dissolve some of it in warm Water, and shake it thoroughly in a tall Vial, then mark the Manner of its subsiding ; if it fall to the Bottom regularly and uniformly, and the Sediment appear of the same Colour at Top and at Bottom, it is probably genuine. If a Part of it subsides much sooner than the rest, and the Sediment when fallen is of two Colours, it is certainly sophisticated. Thrown into any of the stronger Acids, it raises a slight Effervescence ; and on burning in a common Fire suffers very little Change, except that it grows much harder than before.

This Earth has been known for its Uses in Medicine from the earliest Times that we are acquainted with. The very oldest Authors among the *Greeks* mention it, and tell us of its having, even in their Time, when Sophistications of Drugs were not quite so common, as they are at present, been sealed on the Spot, to assure the World of its being genuine. They knew this under the Name of *Lemnian Earth*, or sealed Earth of *Lemnos*, carefully distinguishing it from another red Earth which was found in the same Place, and which was the red *Armenian Bole* before described ; this last they never admitted into Use in Medicine, but called it by Way of Distinction *Lemnian Reddle*, and used it in painting and staining Things.

There is no Question of this *Lemnian Earth's* possessing the Virtues of the other Boles as an Astringent and Absorbent ; its alkaline Quality, which it possesses in a greater Degree than any other of the red Boles in common Use, may also give it a Preference in many Respects, but this is not all we are to expect from it : Beside being of great Use in Diarrhœas, Dysenteries, spitting of Blood, and indeed in Hæmorrhages of all Kinds, we are informed by the Ancients that it is an excellent Medicine in malignant and pestilential Fevers acting as an Alexipharmic and Sudorific. The general Opinion of the World at present is against this, and all that is allowed it is the being a mere Absorbent and Ob-tunder of Acidities ; we are to observe also, that no less eminent a Writer than *Geoffroy*, though he had by some Means made himself acquainted with its more latent Qualities, denies it the last of these, telling us that it does not raise any Effervescence with Acids: this however he must either have taken up at Random from its general external Resemblance to the argillaceous Earths, which, as he very justly observes, most of them do not ferment with Acids ; or he must have made his Experiment with some that was not genuine or not of the red Kind ; for we are very certain, from repeated Experiments made on a Quantity of it brought unsealed, and just as taken out of the Earth in the Island of *Lemnos*, that it has a manifest alkaline Quality and does ferment, though but languidly, with any of the strong Acids.

It has however much more eminent Qualities than this that plead against the common Opinion : we have observed that its very Taste discovers something acrid and bituminous, and accordingly on Analysis it yields a fetid, bituminous Oil,

Oil, smelling something like the coarser *Petroleums*, a fixed Salt of the *Sal Gem* Kind, and an urinous one which some Writers, we know not why, have called volatile, but which on our Analysis proved to be *Natrum*, the native fixed Alkali found in many Parts of the *East*, not only embodied in Earths and Stones, but often loose and pure upon the Surface of the Earth, and that in such Plenty as to be collected by the Natives for Use in the Way of Soap.

These are the Principles which all the genuine red Earth of *Lemnos* will be found to yield on a careful Analysis, and with these it is no wonder that it should be able to do more than mere simple Earth.

When we are sure of having it genuine, we shall always find it a great Medicine in Dysenteries, Erosions of the Intestines, Hæmorrhages of all Kinds, and in Gleets, seminal Weaknesses, and the Fluor Albus in Women. It would be worthy a Trial also, whether the Ancients were in the right in their Praises of it in malignant Fevers, and there appears great Reason to believe it would do Service in the Small Pox and Measles.

Its Dose is from ten Grains to two Scruples. It may very conveniently be given in Form of a Bolus in Fevers, in Diarrhœas and Dysenteries; the more convenient Method will be to dissolve two Drams of it in six Ounces of Milk-Water, and add half an Ounce of Syrup of dry'd Roses; a large Spoonful of this Mixture may be taken after every Stool, and when the Symptoms abate the Form may be varied, and half an Ounce of it be made into an Electuary with two Ounces of Conserve of Roses, and a sufficient Quantity of the same Syrup, a Piece of which of the Size of a Nutmeg may be taken every Night and Morning till the Cure is compleated.

Besides these Uses in extemporaneous Prescription, this Earth is an Ingredient in the *Venice Treacle* and *Diascordium*, in the Confection of Hyacinth, and in many of the astringent Electuaries, Pills and Powders of the Dispensatories of the *German* and other Writers.

Of the Red Boles of less frequent Use in Medicine.

CHAPTER I.

TERRA STRIGONIENSIS, *Earth of Strigonium.*

THIS is one of the sealed Earths frequently sold by our Druggists under the Name of the *Terra Lemnia Rubra*, but which seems much inferior to it in Virtue. It is of a less Compact Texture than any other of the Boles, soft to the Touch, and easily mouldering into Dust when rubbed between the Fingers; we sometimes meet with it in the rough State as dug from the *Stratum*, in which Case it is usually met with in small irregular Pieces, which seem Fragments of larger ones, lying among a Quantity of Dust formed by the breaking to Pieces of others in the Carriage. More usually however we meet with it made up in Form of little Cakes, and sealed with the Figure of Mountains, a Star, and an Escutcheon of two Cross Keys, and with an Inscription of

of *Terra Sigillata Montis Acuti*. If there were any Probability of an Earth so little used as this being counterfeited, we should recommend the Choice of the rude Masses, but in all Probability, if the sealed Cakes are not prepared on the Spot, they are made by our Druggists of the Powder at the Bottom of their Boxes, which is no way inferior to the rest. This Earth is of a tolerably smooth but not glossy Surface, soft and unctuous to the Touch, and of an uniform Structure, not made up of Plates or Leaves as many of the Boles are. It is less heavy than any other Bole we are acquainted with, of a dull and dead, though not a pale red Colour, and seems to have some faint Cast of blewish among it; it is of a brighter Colour when fresh broken than on the Surface, and slightly discolours the Fingers; it adheres firmly to the Tongue, melts very easily and readily in the Mouth, with a remarkable Smoothness and Unctuousity, and with some Degree of Astringency in its Taste, though much less than that of the other red medicinal Earths. In its rough State it leaves a great deal of gritty Matter between the Teeth, and on washing deposits this in Form of a pale yellow Sand: that made up into Cakes is seldom free from the same foreign Matter, though a little Care might easily make it so, the Sand readily sinking from it in washing.

As to the Choice of this Drug, that is best which is most unctuous to the Touch, crumbles most easily between the Fingers, and is freest from Grittiness between the Teeth. There have been Times when this Earth was more used, when the Druggists may have been tempted to counterfeit it, as the other red Boles, with Pipe-Clay and Ochre; but at present there is no Body will be at the Pains: If any be met with, however, so old as to fall in the way of a Suspicion of this Kind, the Tests to prove it genuine or not are these: If put into the Fire the true Earth suffers no Change but that of growing a little harder; if thrown into Water it immediately sends up a few Bubbles to the Surface, and in a few Moments begins to break and by Degrees falls into a fine Powder; if put into any of the stronger Acids it raises a slight Effervescence, scarce so much as that raised by the Red Lemnian Bole.

We have had the Knowledge of this Earth ever since the first working of the Gold Mines at *Strigonium* in *Hungary*, and owe the Knowledge of its Virtues to the Miners there. The Account that is preserved by Tradition among the People who work there at this time, is, that soon after the Discovery of the Ore in that Place the Miners were afflicted with a malignant Fever attended with a continual Diarrhoea, with terribly painful Gripings, and sometimes with bloody Stools; they supposed the Distemper owing to the Vapours of the Mine, and no Body could of a long time be hired to work in it, till one of the Men who had some Knowledge of Bole Armenic, as a Cure for Fluxes, accidentally found this *Stratum* of Red Earth, which he supposed to be the same with it, and cured himself and his Companions by this single Medicine; from this Time the Mine was worked successfully, and the Fame of the Earth occasioned its being sent for from all Parts of *Europe*, and introduced into Medicine as an Astringent and Sudorific.

It lies in a very thick *Stratum* at the Bottom of the Hill, where it was first discovered, and in thinner Beds in many other Places thereabout, but the Earth of the old *Stratum* is preferred to that of any other; a careful Eye will be able to distinguish it from that of other Places, by its being of a pure uniform red,

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whereas that of the smaller Strata is usually fouled with an Admixture of some other Earth, and often spotted with white.

It is found to be an Astringent of considerable Power, and is particularly good in Cases where the Stools are so sharp as to wear off the mucous Matter that defends the Intestines, and erodes them: As to its Virtues as a Sudorific we have only Report for them. It is an Earth that might easily be had in any Quantities, and it is much to be wished that it were brought into Use among us in the Place of the infamous Counterfeits of Bole Armenic that we use at present. It may be very conveniently given in Boluses, from ten Grains to two Scruples for a Dose.

On disuniting its Parts by Water there are separated from it a fine yellowish sandy Matter for the lowest *Stratum* of the Sediment, over this is often a thin covering of a micaceous or glittering talky Substance of a pale Colour, then the red Earth itself, and over it not unfrequently a pale coloured one. It were to be wished if this should again get into frequent Use, that the red Earth alone might be given as that alone is the Medicine. On Analysis it yields an inconsiderable Quantity of Iron.

CHAPTER II.

TERRA LIVONICA RUBRA, *Red Earth of Livonia.*

THIS is of the Number of those medicinal Earths, which though not much in Use at present, highly deserves to be so; and this the more claims our Attention as it may be had from our own *American* Dominions in Abundance.

It is an Earth of a moderately compact Texture, too hard to moulder to Dust between the Fingers, yet easily broken and readily rubbing to a very fine Powder in a Mortar. It has been sometimes brought to us in Masses of six or eight Ounces Weight, but more frequently made up into Cakes of a roundish depressed Figure, and sealed with an Impression of some Mountains, an Escutcheon and the Inscription of *Terra Sigillata vera*, true sealed Earth. One would imagine by this and some similar Instances, that our Forefathers thought the Earth obtained its Virtues from the Stamp of the Seal, and that if it had that it was no Matter whence it came, or what it was, for we find them frequently prescribing *Terra Sigillata* without any farther Distinction, and that at a time when there were twenty Kinds in Use among them.

The *Livonian* Earth is of a tolerably smooth, but not very glossy Surface, soft and unctuous to the Touch, and in its crude State frequently made up of a Number of thin Plates or Strata. It is remarkably heavy, even more so than almost any of the known Boles, of a pale red with something of the Brick Colour in it, somewhat deeper than the true red *Leamian* Earth, and yet less deep than the *Strigonian*. It does not much discolour the Hands on touching it. It adheres very firmly to the Tongue, melts freely in the Mouth with a great deal of unctuous Softness, and a remarkable Astringency in the Taste, but it generally feels very gritty between the Teeth, from an Admixture of Sand that it would be easy to separate from it by washing.

It is at present so scarce in *England* that we need give no Directions about the Choice of it, whatever is met with of it, being probably genuine. The Tests however which prove it to be so are, that it suffers no Change either in Colour or Hardness in a common Fire, that it raises not the least Effervescence with Acids, and that it breaks tolerably readily in Water: if a Piece of an unwrought Mass of it be broken off and experimented with, it usually breaks first into a Multitude of thin Flakes, and from these into a very fine purplish Powder.

It is found in many very distant Parts of the World: In *Portugal* there are many Strata of it near the Surface: In *Germany* and most other of the mining Countries it is found at some Depth in the Hills; and in our *American Colonies* it is very frequent. It has been sent over from two or three different Parts of *Pennsylvania*, and from the Mountains at the Back of *Virginia*, by the indefatigable *John Bartram*, and others, and may be had from thence in any Quantity. The *American* and *European* Kinds answer perfectly in the same manner to all Trials, and possess the same Virtues.

It is a noble Astringent and worthy to stand in the Place of the finest oriental Boles in these Intentions. It has been given in Hæmorrhages with Success, and we have the Sanction of very eminent Authors to its being a Sudorific, and an excellent Medicine in malignant Fevers: Be this as it may, however nothing is more certain than that it has Virtues worthy the Attention of the World: I have experienced it in Diarrhœas of an uncommonly obstinate Kind, which had been used to carry off great Numbers of the Recruits in the *Savoy*, where I had the Care of those of two Regiments, and that with such Success that I scarce lost a Man to whom I gave it: I sometimes gave it alone, but more frequently in Form of a Mixture, three Drams of it in fine Powder with one Dram of *Diascordium* dissolved in eight Ounces of small Cinnamon-Water. I used some of the *American* and some of the *European* Kind on this Occasion, and both with the same Success. It were much to be wish'd that a Proof like this of the Virtues of a Drug easily procur'd might bring it into the Credit it deserves, and banish from the Shops the Sophistications we so constantly meet with there under the Name of the oriental Boles.

On Analysis it is found to contain a small Portion of the vitriolic Acid, the same as that in the common Pyrites, and a larger Quantity of Iron than any other known Bole, not excepting the true *Armenian* red one.

CHAPTER III.

TERRA RUBRA MAGNI DUCIS,
Red Tuscan Earth.

THIS is a Specie of Bole inferior perhaps in its Virtues to the former, yet very worthy to be more known than it is at present in a Country where there is hardly such a Thing as a genuine medicinal Earth to be met with. It is naturally but an impure Earth of a lax friable Texture, and of a tolerably smooth but not glossy Surface, as many of the purer Boles are.

It is brought over to us usually in small Cakes of the Figure of Segments of a Cylinder, of about three Drams in Weight, and mark'd with an Impression of three Trees, an Escutcheon with the Cross Keys, and the common Inscription of

of *Terra Sigillata vera*. These marks however are not to be looked upon as any thing of Consequence, for we often find the very same upon the *Silesian* Earths, and the Impression of the *Strigonian* upon Cakes of this. It is sometimes brought over in the rude Masses which are of an irregular Figure, usually flattish, owing to the natural horizontal Divisions of the Stratum, and of a somewhat spongy and flakey Structure. It is very heavy, of a pale and dead red Colour, much approaching to that of the red Earth of *Lemnos*, but somewhat more of the Brick Colour. It discolours the Hands in touching it: If apply'd to the Tongue it adheres very firmly to it, and when taken into the Mouth is found to be coarse and gritty, but of an astringent Taste, and great Unctuousity. When carefully examined where it is fresh broken it discovers the Cause of this Grittiness in a large Quantity of a very fine white Sand, which is every where embodied in its Mass, and not unfrequently contains beside some Spangles of a fine silvery Talk. All these heterogene Particles ought however to be wash'd out of this and other Earths intended for medicinal Use; but to the Scandal of the People who used to form this into Cakes, they are found as foul as the crude Masses of the Earth.

If it be suspected of not being genuine the Tests are these: Thrown into Water it readily breaks into a Parcel of small flat Masses, and from these in a few Moments into a fine Powder: It raises not the least Effervescence with any acid Menstruum, and on burning in a common Fire is distinguished from the other Boles, which resemble it in external Appearance by its acquiring a Hardness little inferior to that of a Stone.

It is dug in two or three Places in the Neighbourhood of *Florence* and in no other Part of the World so far as is yet known. It generally lies near the Surface.

It is famous in many Places thereabout for its Virtues against Hæmorrhages, and had been used to be a constant Medicine in the Small-Pox, but it is now only given when Diarrhœas attend that Distemper. It seems to have been in Use there for many Ages, but never was in any great Repute any where else: The *German* Apothecaries, who are fond of having all the Subjects of the *Materia Medica* about them, generally keep it in their Shops, and it is to be met with in some of our old Druggists Ware-houses, but has been very seldom heard of in Prescription, or used, except under the general Name of *Terra Sigillata*, as an Ingredient in some of the Compositions of the Shops.

A small Quantity of Iron may be separated from it by means of the common white Flux with powder'd Glass and Charcoal, but it contains less of this Metal than the Generality of the red Earths.

CHAPTER IV.

TERRA PORTUGALLICA RUBRA, *Red Portugal Earth.*

THIS is another of the Drugs of this Class, neglected at present, but very worthy to be call'd into Use again. We do not suppose it necessary that all the astringent Earths which have been used in different Places, and by that means obtained a Place in Catalogues of the *Materia Medica*, should be brought into Use again among us. All we plead for is the introducing two

or three of them into the Shops, in the Place of some Counterfeits of the *Oriental* Boles which are now almost all of this Kind that are used; and we should be happy to point out, of the Number of those celebrated by Authors who are fond of speaking well of every Thing, which they are that are most worthy of this Notice.

Among these the red Bole of *Portugal* is one of the first. It is a firm, compact and moderately hard Earth, of a smooth, even and glossy Surface. It is usually brought over to us made up into thin and flat Cakes, resembling small Segments of Cylinders, sealed with the Impression of a Wreath round the Edges, and with the Words *Terra Sigillata* filling up the Space within. When in the crude or unwrought State it is generally met with in large Lumps of half a Pound or more in Weight, which are soft and unctuous to the Touch and not easily broken. It is of a fine florid red Colour, not a little resembling that of the true red Bole of *Armenia*, but somewhat deeper and without the orange Tinge which that has: It is deeper colour'd where fresh broken than on the Surface: It does not discolour the Hands on touching it, and when wetted appears of a fine Purple.

Apply'd to the Tongue it adheres more firmly to it than any other of the red Earths, and if taken into the Mouth does not fill it with the Unctuousity so remarkable in many of the Boles, but has an Astringency in its Taste superior to that of most of them. It is never pure however, but leaves a disagreeable Grittiness between the Teeth, which is owing to some Particles of a fine Sand blended with it.

If what is at any Time met with, be suspected of not being genuine the Tests are these: A small Piece of it thrown into Water soon breaks and falls into a fine purple Powder, not separating first into Flakes or little Lumps as many of the other Boles do. It raises no Effervescence with the strongest acid Menstruums, and on burning in a common Fire suffers no visible Change; if the Heat be encreased indeed to a greater Degree it acquires the Hardness of a Stone, and will give Fire on being struck against a File.

We owe the Knowledge of this Earth to the *Portuguese*, among whom it was many Ages ago famous for curing malignant Fevers, and for its Virtues against the Bites of venomous Animals. We have had no Opportunities of trying it in the latter Cases, nor have cared to depend too much upon it in the former; but can affirm from Trial, that it has the common Virtue of the other red Boles, and is an Astringent of the first Class.

It is dug in many Places in *Spain* and *Portugal*, and is not found in any other Part of the World so far as is yet known. It is most conveniently given in Form of a Bolus, and what ought to recommend it in Preference to many of the other Earths is, that it succeeds in a smaller Dose than most of them: A Scruple of it is as much as need ordinarily be given.

It is richer in Iron than any other of the red Boles. I have produced from half an Ounce of it a Scruple of that Metal.

CHAPTER V.

TERRA TURCICA,
Turkish Earth.

THIS Earth seems to have the least Astringency of any of the Boles of this Section, but it stands recommended in Authors of great Credit as a Medicine of very great Value in some other Intentions.

It is a somewhat soft and friable Earth, of a lax and somewhat spongy Texture, of a very remarkably smooth and glossy Surface, and soft and unctuous to the Touch. It is rarely imported in the crude Mass into *Europe*, but usually comes over to us in Cakes of a depress'd orbicular Form, with a small Surface flatted at the Top, and there mark'd with *Turkish* Characters. It is less heavy than almost any of the other Boles, and its Colour is so remarkable that it very readily distinguishes it from all of them. It is a Mixture of a pale flesh Colour and a dusky Grey, and is very remarkable for the Redness wearing off as it is exposed to the Air, and for being much brighter in Places where it is fresh broken than on the Surface. It does not at all stain the Fingers in handling: If apply'd to the Tongue it adheres but very slightly to it, and if taken into the Mouth it melts freely in it, spreads an Unctuousity over the Tongue and Palate, and leaves a disagreeable Flavour behind it, though it has less of the Astringency of the Generality of these Earths than almost any other of them. It is seldom so pure but that on these Trials it leaves some Grittiness between the Teeth.

As to the Choice of it the brightest colour'd, that which has most Redness and is of the most disagreeable Taste is to be prefer'd. If there be any Suspicion of its being genuine, though indeed it is of all the Earths we are acquainted with the most difficult to be counterfeited with any Prospect of Success, the Fire gives us a Test that is sure to discover it; for if but moderately burnt the genuine Kind acquires a considerable Hardness, and what is very singular becomes of a dusky yellow Colour: In this State if two Pieces of it be rubb'd against one another till they grow very hot there is a strong bituminous Smell produced from them. Something like this we have observed is the Case in regard to all the Earths that are capable of being burnt to a proper Degree of Hardness, but it is too singularly strong in this to suffer it to be rank'd among the rest in this Respect.

This Earth seems to have been known among the Eastern Nations as long as we have any Accounts of things, but it has never been in any great Repute among us. It is found near *Adrianople* and in many other Parts of the *Turkish* Dominions, but as far as we yet know it is peculiar to that Part of the World. It generally lies at eight or ten Feet Depth, not in regular Strata but in large Masses, some of them two or three Feet long and half as much or more in Diameter; which are carefully taken up, clear'd from the adjoining Earth and made up into the Balls in which we see it without any further Preparation.

It is used in the Eastern Parts of the World as a Sudorific and Alexipharmic. They give it in the pestilential Fevers frequent there, as is said, with great Success, and make it one of their chief Medicines in the Plague itself in many Places.

On Analysis it affords not the least Sign of Iron, so general among the rest of the Bodies of this Class, but affords a small Quantity of a thick bituminous Oil of a very disagreeable Smell.

Of the yellow B O L E S.

TH E Class of Boles that are in most general Use next after the Red, are the yellow ones. Of these we have only two that are of common Use in the Shops: These are, 1. The yellow *Armenian* Bole, which was the true Bole Armenic of the Ancients. And, 2. The yellow *French* Bole, or *Bole of Blois*, an Earth that comes much nearer to the Nature of the true oriental yellow Bole, than any *European* Earth yet known does to that of the red one.

Of the Number of those which have a Place in the Catalogues of the *Materia Medica*, but are less frequently used in the Shops, are 1. The *Bolus Toccaviensis*, very pure and of a friable Texture. 2. The *Terra Lemnia flava*, or yellow Bole of *Lemnos*, which is of a pale Yellow and very hard. 3. The *Terra Lignicensis*, which is a fine friable Bole of a bright gold Colour. 4. The *Terra Silesiaca*, a brownish yellow Bole of *Silesia*. 5. The *Terra Livonica lutea*, a light friable Bole of a reddish Yellow. And, 6. The *Bolus Bohemica*, which is firm, heavy and also of a reddish Yellow.

Of the yellow Boles in common Use.

CHAPTER I.

BOLUS ARMENA LUTEA, *Yellow Bole Armenic.*

TH I S is a medicinal Earth, which more than all the other Kinds deserves our Attention for the remarkable Things recorded of its Virtues by the Ancients.

It is a moderately firm or hard Earth, of a most remarkably smooth and glossy Surface, soft and unctuous to the Touch, and is generally sent over to us in Lumps of an irregular, though usually flattened Figure; and from an Ounce to half a Pound in Weight. It is of the most even, compact, regular Structure of any of the yellow Earths, and in Consequence of this it is the heaviest of them all. Its Colour is an extremely pale and elegant Yellow with a very faint Admixture of reddish among it, and it is remarkable that one seldom sees this Admixture of the Red either more or less prevalent if one breaks a hundred Pieces of it. It does not at all discolour the Fingers in handling unless violently rubb'd against them: It is usually somewhat paler and has less of the reddish Cast on the external Surface than where fresh broken. Applied to the Tongue it adheres very firmly to it, and if taken into the Mouth melts slowly but perfectly in it, and is of a remarkably astringent Taste amidst its great

great Unctuosity ; and is naturally so pure, that it does not give the least Grittiness or Sensation of a hard Particle between the Teeth.

The finest is that which rubs most easily to Powder in a Mortar, which blends itself most readily with Water, and remains the longest suspended in it, and that which does not break too easily between the Fingers. Our Druggists have not yet arrived at the Art of sophisticating it by Mixtures ; but as it is very rare at present in *Europe*, they will be apt, to save the Discredit of their Shops in saying they have it not, to sell the yellow *French* Bole next to be described in its Place.

If it be suspected not to be genuine, the Tests are these ; if a Piece of it be thrown into Water, it gradually moulders after a little Time into a beautiful orange coloured Powder ; it raises a very considerable Ebullition with any of the stronger Acids, and if burnt in a moderate Fire acquires a stony Hardness, and much deeper Colour ; but what is remarkable with no additional Redness.

These are the Characters that will distinguish it from all the other yellow Boles with great Readiness, except from that of *Blois* ; but however near this comes to its Nature, the true *Armenian* Bole is always distinguishable by its Weight, its superior Hardness, its raising a less Ebullition, than that Earth does with Acids, and by its not so readily diffusing itself in Water.

The Knowledge of this Earth as a Medicine is to be dated from the Days of *Galen*. The *Greeks* before his Time gave the Preference to the red *Lemnian* Earth, and it was not till long afterwards that the red *Armenian* Bole got into Use at all. *Galen* seems first to have given this in the Plague that raged in *Rome* in his Time, and he tells us that he cured many by means of it ; and adds, that those who took this in vain never found Relief from any other Medicine. From this Time it grew famous and continued so for many Ages, till at length about the Time of *Avicenna*, the red *Armenian* Bole was used in its Place, and so little Regard paid to the Writings of the Man who first brought it into Use, that this was supposed to be the Earth he recommended, though he in the plainest Words imaginable tells us that the *Armenian* Bole he used was very hard, very heavy, of a pale yellow Colour, and so pure that it did not contain the least hard Particle in it : A Description that so well agrees to the Substance described above, that no Man who has ever seen that, will attribute it to any other Earth in the World.

It is found in *Armenia*, and according to *Cardan* in *Samos* and some other Parts of the World ; that Author does very ill however to deny it to *Armenia*, since the Pits which now furnish the greatest Quantities of it are in the Mountains in the Neighbourhood of *Erzeron*.

We are not well assured of the alexipharmic Virtues ascribed to this Earth by *Galen*, we have fallen of later Ages into the Use of other Medicines so much more powerful than a simple Earth can be supposed to be in this Intention, that we are afraid to place too much Dependance upon it in Cases of so much Danger as those it is recommended in. As an Astringent and Absorbent however I have long experienced it as equal to any of the Boles, superior to most of them. It is singly a Remedy that seldom fails in Diarrhoeas, and joined with the Bark, Dragon's Blood and Alum, has cured Hæmorrhages that would have frightened many a Prescriber.

It is always to be had from *Germany*, and might be obtained almost as easily from the Place whence they have it, that is from where it is dug; and as it is more plentifully dug than the red *Armenian* Bole, and less liable to be sophisticated, it were much to be wished that it was introduced among us in its Place, as well in extemporaneous Practice, as in the Compositions of the Shops, the principal of which whose Composition it enters *Diascordium*, would be an infinitely better Medicine for it.

On Analysis it is found to contain the same Sort of bituminous Oil that many of the *Oriental* Earths do; a small Portion of a Salt of the *Sal Gem* Kind, and a very small Quantity of Iron.

CHAPTER II.

BOLUS BLESENSIS, *Bole of Blois.*

THIS is evidently the second in Purity and Value of the Boles of this Class, and when the yellow *Armenian* Kind cannot be had, is of all others the most worthy to be employed in its Place.

It is an Earth of a moderately compact and firm Texture, of a tolerably smooth and glossy Surface, very soft and unctuous to the Touch, and of an irregular Structure; sometimes formed of little Granules, regularly arranged so as to compose one uniform Mass; sometimes of a great Number of thin Flakes laid with great Regularity over one another. It is usually brought to us in Masses of four or more Ounces Weight. It is of a beautiful pale yellow Colour, little darker than what we usually express by the Word Straw-Colour, but with a faint Blush of a Reddishness usually diffused among it. In this it greatly approaches to the Appearance of the yellow *Armenian* Bole, but then it differs widely from it, in being as much lighter than the Generality of the yellow Boles, as that is heavier. It does not discolour the Hands on touching it; if applied to the Tongue it adheres very firmly to it, and if taken into the Mouth melts readily in it with an unctuous Smoothness, and a very astringent, but not disagreeable Taste; and is naturally so pure, that though sent to us without any Preparation, it contains not the least hard Particle, nor gives the slightest Grittiness between the Teeth.

It is to be chosen light, friable, and of a bright Colour. It is not easily liable to Sophistication, but if a Cheat of that Kind should be attempted, it would be easily discovered, as there is no native Earth that does, nor would it be easy to make any Composition that would effervesce so violently with Acids, break and diffuse itself so readily in Water, and burn to so remarkable a Hardness as this does, yet without becoming red as the common yellow Earths in general do. I have once met with a factitious Matter sold under the Name of it, which on separating its Parts appeared to be made of Pipe-Clay and the fine yellow *French* Ochre sold at our colour Shops, but beside that this had not any Thing of the natural Colour, it raised no Effervescence with Acids, and became red as soon as heated in the Fire.

There is another Mistake which sometimes happens in the buying this, which is, that our Druggists who trade to *Hamburgh*, sometimes receive the true yellow

low *Armenian* Bole from thence, and as they are never likely to be asked for it under its own Name, sell it as Bole of *Blois*; but as this is a Mistake that it were to be wished happened much oftener than it does, we need be at no Pains about guarding against it.

We owe the Discovery of this valuable Earth to the Fraud of some *French* Druggists, who finding it near Home, and observing that it much resembled the true *Armenian* yellow Bole, took it into their Shops in its Place, and sold it under its Name, before they knew how nearly it came up to it in its Virtues.

It is common in many Parts of *France*, where it usually lies at no great Depth. The Shops of *Paris* and other Places are at this Time principally supplied from about *Saumur*, *Bourgogne*, and the Place from whence it has its Name. There is some indeed found in the Neighbourhood of *Paris*, but it is seldom so pure as that of the other Places.

It is an excellent Astringent, and after the *Oriental* Earths may dispute the Preference with any of the known Kinds. Its being easily had, and not easily sophisticated, are also strong Reasons for our wishing it might be brought into Use. Its Dose when given singly is from a Scruple to half a Dram, and it goes down most conveniently of all in Form of a Bolus.

On Analysis it appears to contain some small Portion of a vitriolic Salt, but it is not easy to separate any Quantity of Iron from it, as may be done from most of the other yellow Earths.

Of the Yellow Boles less frequently used.

C H A P T E R I.

BOLUS TOCCAVIENSIS, *Bole of Tokay.*

THIS is one of the yellow Boles, which though not much used at present, certainly would be so if their Virtues were more generally known, and they were more easily come at.

It is an Earth of an even regular Structure, appearing to the Eye very compact and firm, yet easily breaking between the Fingers. It is of a fine, even, smooth, and glossy Surface, very soft and unctuous to the Touch, and is usually sent over to us in small Masses of an irregular Figure. It is moderately heavy, of a strong and beautiful yellow Colour, not easily staining the Fingers in handling, and generally is of a deeper Colour where it has been fresh broken, than on those Surfaces that have been long exposed to the Air. Applied to the Tongue it adheres very firmly to it, though not so much as the *Armenian* or *French* yellow Bole; but if taken into the Mouth it has an Astringency in its Taste superior to either of those or to any other of the Earths of this Class, and often is brought over so pure as to give very little Sensation of Grittiness between the Teeth: This however is not always the Case, for we have met with genuine Earth of this Species that has been too foul for Use without previous Washing.

It so rarely gets into the Hands of the Druggists in *England*, that it is scarce necessary to give any Rules for its Choice; only it may be observed that the

heaviest, the deepest coloured, and the purest or freest from Sand is the best. If there be Occasion to try whether it is genuine, its Characters are, that it lies longer in Water before it begins to break, than most of the Boles of this Kind, but that when it begins to moulder it is in a few Moments reduced to Powder; that it raises a very strong Ebullition with Acids, and agrees with the *Armenian* and *Gallic* yellow Boles in not becoming red in burning, only acquiring a stony Hardness by it, and a somewhat deeper yellow with a Tinge of Brown.

This Bole has been known many Ages in *Bohemia* and *Hungary* and in some other Places. It is the Earth which *Kentman* mentions under the Name of *Bolus pannonica vera*; and which *Crato* calls *Bolus Hungarica*, and declares from his own Experience to be equal, if not superior, to the true *Oriental* Bole so celebrated by *Galen*.

It is dug principally in *Transylvania*, about the Place whence it has its Name. It generally lies at considerable Depths.

The Author whom we have just quoted for his lavish Praises of this Earth, declares it to be one of the greatest Medicines known in malignant Fevers. We have known it tried as an Astringent, and can affirm that it deserves all the Praise he can bestow upon it for its Effects in that Intention.

On a careful Analysis it yields a small Portion of a vitriolic Salt.

CHAPTER II.

TERRA LEMNIA FLAVA, *Yellow Lemnian Earth.*

THIS is an extremely singular Earth, as it is truly a Bole in all its Characters, and yet of the Colour of an Ochre. It is a very firm and compact Earth, remarkably hard, of a smooth, even and glossy Surface. It is rarely brought to us in the rough Mass, but usually in small Cakes, in Form of short Segments of a Cone, and signed with the same Impression and Characters as the red Earth of the same Place; that is with a Crescent, three Stars, and two Palm-Branches, and with the Words *Terra Lemnia*. It is of a very regular and extremely close Structure, remarkably heavy, and of a fine, bright, florid yellow, approaching to that of the finest *English* Ochre. It does not at all stain the Fingers in handling: if applied to the Tongue it sticks to it, but not so firmly as some of the other yellow Boles, and if taken into the Mouth it melts very freely in it, and is of an astringent Taste, and so pure that it does not leave the least Grittiness between the Teeth.

This Earth is not much used with us at present, but by what we find of it in the Shops, as well as what we receive of it from among the *Germans*, it appears that no one of all the yellow Boles is so frequently sophisticated. It is easy however to give Tests by which so singular an Earth as this is may always be known, and by which every Counterfeit of it may be easily discovered. When genuine, if a Piece of it be thrown into Water it retains its Consistence a considerable Time, and then very slowly and gradually moulders away to Powder. If thrown into the strongest Acids it makes not the least Ebullition with them; and when calcined in a moderate Fire, it acquires a stony Hardness, and a dusky brown Colour. This last Singularity of its not
burning

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burning red as the common yellow Earths all do, proves it to be of the same Nature of the *Armenian* and other fine yellow Boles, and distinguishes it from all the Counterfeits that can be made of it with the common Ochres and Clays, and all these discover themselves almost as readily by their diffusing and breaking sooner in Water.

The common Counterfeits of this Earth are made with Pipe-Clay and yellow Ochre; these always burn red: we have met also with some made of a white Earth coloured with Turmeric, a strange Invention, very ill resembling a native Earth, and easily discoverable, not only by burning, but by blending it with Water, and shaking in a Vial; in which Case the colouring Matter all floats to the Top, and a white Earth remains at the Bottom.

When we are sure this Earth is genuine, the farther Choice consists in taking the hardest and firmest Pieces, those of the most florid Colour, and such as have no Spots of a reddish Colour in them; though this last ought to be no great Objection, for those Variegations are only caused by Pieces of the true red *Lemnian* Earth accidentally mixed among it.

This Species of Bole has been long known in the World, but it does not seem ever to have been in very great Use. Our Druggists sometimes have received and sold it under the general Name of sealed Earth, in which Case it has been made an Ingredient in the *Diascordium*, and other Compositions of the Shops by Apothecaries, who have understood every thing to be right that was sealed in *Germany*. They sometimes use it as a Vulnerary, both internally and externally; in the latter Case they mix it into a Paste with Vinegar, and lay it on a Bruise or Luxation. In the Eastern Countries it obtains as a Sudorific, and is given in pestilential Diseases. I have experienced it to be an Astringent, but that in a very inferior Degree to many of the other yellow as well as red Boles.

It is dug only in the Island of *Lemnos*, where it is found in the same Pits with the red Earth of that Place generally lying over it in thin Strata, but sometimes in much greater Quantity at greater Depths.

All the Trials we have been able to make have not produced a Grain of Iron, or of any thing ferrugineous, ochreous, or vitriolic from this Earth: it contains a Salt of the *Sal Gem* Kind, but in a very small Proportion, and somewhat of that bituminous Oil found in the other *Oriental* Earths of several Kinds, though this also in a less Quantity than any other of them that is known to yield it at all.

CHAPTER III.

TERRA LIGNICENSIS LUTEA, *Lignicensian Yellow Bole.*

THIS is a very beautiful Earth, which from its Colour has been by some confounded with the yellow *Lemnian* Bole, but we must observe that this can only have been by such as never saw the other genuine.

It is a lax, friable, and soft Earth, of an irregular yet somewhat glossy Surface, soft to the Touch, and of a very irregular Structure, seeming when broken to be composed of a Multitude of smaller Masses thrown confusedly together and not well incorporated with or adhering to one another. This is the Case in
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what we see of this Earth in its natural State, as it is generally kept in the *German* Shops: They have it in small brittle Masses just as it has fallen from the Spade in digging. In other Places we generally see it sealed with an Impression of Trees or Buildings and an Escutcheon, and with the Words, *Terra Sigillata vera*; in this latter Case it has been wrought up into little Cakes by beating in a Mortar, and then cutting out with a hollow Instrument, and therefore it shews nothing of its original Structure in them, though it is still soft and crumbly.

It is less heavy than most of the yellow Boles, greatly less so than the yellow *Lemnian* Earth with which People are apt to confound it. Its Colour is a bright and elegant Yellow approaching nearer to that of Gold, than that of any other Earth. It is deeper than the *Lemnian*, and has yet more than it, the Appearance of an Ochre, but it does not discolour the Hands; applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it melts slowly in it, with a great Smoothness and Unctuousity and a very manifest Astringency afterwards. In its crude State it is usually coarse and gritty between the Teeth, and in the Generality of what is met with made up and sealed, it is no less so; but we have sometimes met with Pieces of it very pure from this hard Matter.

The finest of this Kind of Bole is that which is of the highest and most florid Colour, of the most astringent Taste, and such as melts easiest in the Mouth, and in small Pieces crumbles the most readily to Powder between the Fingers.

It is so scarce among us, and so little called for, that our People have not found the way of adulterating it. In *Germany* that found among the Apothecaries in the crude Masses is generally good, but the sealed Cakes are often only a common yellow Clay. The Tests by which it is discovered to be genuine are, that if thrown into Water it almost instantly crumbles to Powder, if calcined in a moderate Fire it does not become red, but grows a little harder and of a pale brown Colour, and if thrown into the strongest Acids it makes no Ebullition.

It seems to have been long known in *Germany*, where it has continued to this time in great Repute. They give it in Cordial and astringent Electuaries, and seldom make up a Bolus in some Places without it for a Fever of any Kind.

It is dug in many Parts of the *German* Dominions, particularly about *Emeric* in the Circle of *Westphalia*.

We know nothing of its cordial or sudorific Virtues, but have found it by Experience to be an Astringent not inferior to many of the Earths of greater Fame as such among the Generality of Writers.

CHAPTER IV.

TERRA SILESIACA, *Silesian Earth.*

THIS is a Bole of very great Fame in many Parts of the World, though not much known among us. It is a somewhat soft and friable Earth of a smooth Surface, but not so glossy and shining as some of the other Boles, soft and unctuous to the Touch, and of an extremely irregular Structure. It is

is found in the *German* Shops in rude Masses seldom very large, and easily breaking to Pieces in the handling; what little we see of it here is generally made up into Cakes of about half an Ounce in Weight of the Figure of Segments of Cones, and stamp'd with the Impression of a Star, an Escutcheon with Cross Keys in it, and a Row of Mountains, and with the Words *Terra Sigillata Montis acuti*: it is remarkably heavy and of a dead brownish yellow Colour. It does not discolour the Fingers in handling, and is usually found to be of a yellower Colour where fresh broken, than on the Surfaces which have been long exposed to the Air: applied to the Tongue, it adheres less firmly to it than most of the other Boles, and if taken into the Mouth melts freely in it into a soft unctuous Matter with a moderate Astringency in the Taste; sometimes it tastes a little gritty, but this is owing to the Carelessness of the People employed in collecting it, who have suffered some extraneous Matter to fall in among it; for in its own Nature it is as pure and free from hard Particles as the *Armenian* Bole itself.

It is to be chosen heavy, friable and soft, not too yellow, or mixed with yellowish Matter in Form of Spots: This is frequently the Case indeed of the genuine Earth; but in this Case, tho' genuine, it is not pure, these yellower Blotches being owing to an Admixture of another Earth of a very different Nature from this. It is not much liable to be sophisticated, its brownish yellow Colour being so singular that it is not easy to be imitated with any tolerable Degree of Success: if it be suspected however, it will easily be known to be true or false by the following Characters; if thrown into Water it breaks almost immediately into a Number of thin Flakes, and from these in a few Moments falls into a fine brown Powder; mixed with the strongest Acids, it makes no Ebullition, and on burning in a common Fire it acquires a great Hardness and becomes of a Chocolate Colour.

It has been known a long Time in many Parts of the World as an Astringent, but People are not contented with giving it this Praise, but will attribute to it all the Virtues that *Galen* has given to his Bole Armenic, and pretend to cure Fevers, even malignant and pestilential ones with it.

It is found about the Gold Mines of *Strigonium* in *Hungary*, but is not dug out of a *Stratum* there, but picked up by the Miners out of the perpendicular Fissures of the Rocks which it frequently fills up. It is supposed to be impregnated with the Sulphur of the Gold of those Mines, and has thence obtained the pompous Name of *Axungia Solis* among the Chymists, and perhaps thence also its imaginary Virtues as a Cordial and Sudorific: all we know of it from Experience is, that it is an Astringent of equal Virtue with most of those of this Class.

The most careful Analysis we have been able to make of this Earth by Fire, never could furnish us with any thing like Gold from it; Iron indeed it contains, but that in but a very inconsiderable Quantity.

CHAPTER V.

TERRA LIVONICA LUTEA,
Yellow Livonian Bole.

THIS is one of the Boles easily had in any Quantity, and very worthy to be introduced into more frequent Use than it is at present among us.

It is one of the softer and more friable Earths, and is found in the Shops in small rude Masses of irregular Shapes, and easily breaking to Pieces in the handling, or else in small Cakes of about a Dram Weight of the Shape of thin Segments of a Cylinder, and stamp'd with the Impression of a Church, an Escutcheon with Cross Keys, and the Words *Terra Sigillata*. It is naturally of a tolerably smooth and glossy Surface, soft to the Touch, and does not stain the Fingers in handling, unless broke to Pieces or rubbed forcibly against them. It is considerably heavy, and is very remarkable in its Colour, which is a Mixture of a dusky yellow and a bright red: These are sometimes so perfectly blended together as to make the whole Mass of a regular Orange Colour, but usually they are kept more separate, the yellow being the Ground or Basis, and the red variously blended among it in Form of larger or smaller Spots or Stains. This red is an Earth really different from the yellow one, but we do not understand the yellow alone to be the Earth we mean by this Name; we expect to find the red among it, and it is much the same thing to all Purposes, whether it be regularly blended in its whole Mass, or disposed only in Spots and Blotches. Applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it melts very readily in it with an unctuous Smoothness, and a remarkable Astringency, and is so pure that it leaves not the least Grittiness between the Teeth.

It is remarkable that the Earth of this Kind, which we meet with made up into Cakes, has the two several Matters it is composed of no better mixed than they are found to be by Nature, the red being as frequently found in Spots in these as in the natural Masses. This may serve as a Proof that the sealed Earths, we mean such as are genuine, are made up with very little Ceremony; for if this Kind were either beat in a Mortar, or washed, as is the best way of all, it would be impossible but that the two Colours must be better mixed.

The finest of this Earth is such as is most friable, adheres the most firmly to the Tongue, and has a moderate Portion of the red mixed with the yellow. If it is suspected of Sophistication the following Characters will determine it; the genuine Earth thrown into Water very readily breaks into a Number of small Masses, and in a few Moments falls from these into a fine Powder; mixed with the strongest Acids it does not make the least Effervescence, and when heated red hot in a moderate Fire, it becomes a little harder and darker coloured, but not uniformly red as almost any Counterfeit of it would do, the yellow Earths in general burning to a Redness.

It is found in many Parts of *Germany*, and in several Places in *Spain* and *Portugal*, and is generally esteemed a very valuable Medicine. It is certainly an Astringent of the first Class, and would very happily supply the Place of the common Sophistications sold under the Name of Bole Armenic in our Shops.

C H A P T E R

CHAPTER VI.

BOLUS BOHEMICA,
Bohemian Bole.

THIS is a very pure and valuable Earth, inferior to few of this Class in its Virtues.

It is one of the more soft and friable Boles, though of a compact Texture. It is brought to the *German* Shops, where it is principally known in small Masses as it falls from the Spade in digging, never having had any after Care bestowed upon it. In these it appears of a tolerably smooth and glossy Surface, very soft and unctuous to the Touch, and when broken is seen to be of a regularly laminated Structure, every Mass of it being composed of a vast Number of fine thin Flakes, evenly disposed and firmly united to one another. We do not mean to say that there never was any such thing as a Piece of *Bohemian Bole* seen of a simple Structure: In so rude a thing as a *Stratum* of Earth pressed in various Manners by the superincumbent Matter, there will necessarily be Varieties of this Kind, and where it is pressed down more than in any other Place, or where with only the same Weight above, it has more Moisture from some little dribbling of Water, its Plates or *Lamina* may be easily forced down into one another, so as to form one common plain and uniform Mass; but this seems not to be often the Case with the Strata of this Earth. It almost always shews its laminated Structure very plainly, and will often split horizontally where the Flakes happen to join less intimately than in other Places.

It is probably owing to this also that the Masses we see of it are usually flat, as having naturally fell off in horizontal Plates from the *Stratum*; and in Confirmation of this it may be observed, that all the Boles we know of, which are naturally of this flaky Structure, are found in general in the Shops in the same Sort of flat Masses.

The *Bohemian Bole* is remarkably heavy, scarce less so than the true yellow *Armenian* Kind, though so vastly inferior to it in Hardness. In Colour it is of an elegant yellow, somewhat deeper than the *Blois* or *Tokay* Kind, and has always a faint Blush of Reddishness in it. It does not discolour the Hands, appears much deeper, and has more Redness when wetted, and is generally also somewhat redder on the Inside, than on the external Surface, that has been long exposed to the Air. Applied to the Tongue it adheres firmly to it, and if taken into the Mouth it does not melt so readily as many other of the Boles in it; but when it does it gives the same unctuous Softness with the rest, and has a remarkable Astringency. It is always so pure, that it leaves not the least Sensation of Grittiness between the Teeth.

It is to be chosen soft, friable, of a bright Colour, not rough or dusty on the Surface, and such as is longest before it melts in the Mouth. If suspected of not being genuine, the Characters that will distinguish it are these; if thrown into the Water it after a few Moments begins to crack on the Surface, and soon after falls into a Number of thin Flakes, and from these into a fine orange coloured Powder. The strongest Acids being poured on it make no Ebullition or Effervescence, and it suffers no Change in the Fire except that

of growing much harder than before. If it have been counterfeited with any of the common yellow Earths, they are discovered by turning red on being burnt; but if (which is more frequently the Case) the Bole of *Blois* be sold under its Name, that is discovered by its raising a violent Ebullition with the Acids; this however is a Cheat of no great Consequence, as they are both Earths of great Virtue, and that in the same Intentions.

The genuine Earth is found not only in *Bohemia* and *Silesia*, but in many other Parts of *Europe*, and in some of our *American* Plantations. It has been long in Esteem among the *Germans* as an Alexipharmic, and is believed by many to possess the Virtues of old ascribed by *Galen* to his *Armenian* Bole: All that we know of Certainty of it is, that it is a very good Astringent, and seldom fails of Success in Diarrhœas of the most obstinate Kind. There is some Reason to suspect that the external Resemblance of this Earth to the *Armenian* yellow Bole, has led People into an Opinion of its possessing the same Virtues; but if the Assertions of those Authors who affirm this have no better a Foundation, they will stand on but a poor Footing, when we observe that the two Earths differ extremely in their more essential Properties, the *Armenian* being an Alkali, this not; and the *Armenian* affording several active Principles on Analysis, not one of which this has; all that can be separated from it being a very small Portion of a vitriolic Salt.

Of the WHITE BOLES.

OF the three Classes of Boles according to the Division by their Colours, that of the white Kind furnishes the Shops with the smallest Number; and even those the least eminent and celebrated for their Virtues, except by particular Writers, or in particular Places. The Ancients indeed have left us the Names of many white Earths of this Class, but the World in general has of later Ages been so regardless of them, that little but their Names have been known.

It appears however by the Success I have had in procuring them that they are yet to be obtained, if we will be at the Pains of seeking properly after them; and by the Experiments I have made of them in Medicine, that some of them at least are worth the sending for.

The Care of a Place where Diarrhœas of the worst Kinds are among the Number of Diseases never absent, has given me an uncommon Opportunity of trying Medicines recommended by the greatest Authors of Antiquity, but little known at present in their Cures; among these the Boles of various Kinds have held a principal Place, and have been proved to be worthy much more Respect than is at present paid them by the World.

The Distinction of the more or less frequently used, according to which we have, to prevent an unnecessary Embarrassment to the Readers of less Curiosity, divided the former Classes of Boles, has no Place here; since we cannot say that any of the white Boles are frequently, hardly that they are at all used in our Shops at present. There are however no less than seven of them described by Authors, the Names of which stand in our Catalogues of the *Materia Medica*, and which I have procured and experimented.

These are 1. The *white Bole Armenic*, which is the purest and finest of them all. 2. The *Terra Noceriana*, harder and heavier than the former. 3. The *Terra Lemnia Alba*, a friable, light, and very white Kind. 4. The *Terra Goltbergenfis*, or *Axungia Lunæ* of the Chemists of a greyish Colour. 5. The white *Tuscan Bole*. 6. The *Terra Melitenfis*, a white Bole very different from the Earth described by Authors under that Name, which is a Kind of Marl to be described hereafter ; and 7. The *Terra Eretria*, an alkaline greyish Earth. Of these in their Order.

CHAPTER I.

BOLUS ARMENA ALBA,
White Bole Armenic.

THIS is the purest of all the known Earths, and approaches the nearest of all the known native Fossils, to what the Chemists understand by the Name of pure simple Earth. It is of a very close, compact, and even Texture, naturally of a smooth and glossy Surface, very soft and unctuous to the Touch, and does not at all discolour the Fingers in handling. It is considerably heavy, and of an extremely clean and bright white Colour : It is not apt to grow yellow on the Surface, as many other of the white Earths do in keeping, but retains its natural milky Hue as perfectly there, as within. It adheres pretty firmly to the Tongue, though not nearly so much as many other Earths of this Class ; if taken into the Mouth it breaks slowly in it, and fills it with an Unctuousity, but has not the least Astringency in its Taste, and is so pure that it leaves no Grittiness between the Teeth. Though of a very compact Texture, it is far from being one of the hard or firm Earths, but crumbles very easily to Powder between the Fingers.

If thrown into Water, it after a few Moments moulders away into a fine milk white Powder. If calcined in a moderate Fire, it acquires a considerable Hardness, and retains its white Colour ; and if put into the strongest Acids, it makes not the least Ebullition with them.

It is found, so far as is yet known, in no Part of the World except in *Armenia*, and there in no great Plenty. It has long been famous as a Sudorific, an Alexipharmic, and a Remedy for venomous Bites ; but upon how good Authority does not appear ; all that Experience warrants for it is, that it has some Virtue as an Astringent, but this in so small a Degree, that there are very few even of the white Boles that are not to be preferred to it.

CHAPTER II.

TERRA NOCERIANA,
Nocerian Earth.

THIS is a very compact, firm, and hard Earth, naturally of a smooth and glossy Surface, very soft and unctuous to the Touch, but slightly discolouring the Fingers in handling. It is not known among our Druggists, but is frequent in the *Italian* Shops, where it is generally met with in Masses of an

an irregular Figure, not flat as those of many other of the Boles are, and of six, eight, or more Ounces in Weight. The larger than ordinary Size of these is owing to its being more tough and viscid while in the *Stratum* than many of the other Boles, and in this Light we find that even a Thing that might be looked on as so perfectly accidental as the Shape or Bigness of a Piece of Earth, gives us a probable Conjecture as to its Structure and Qualities.

It is remarkably heavy, of a greyish white Colour, and generally much whiter and brighter where fresh broken than at the Surface. Applied to the Tongue it adheres firmly to it; if taken into the Mouth it melts but very slowly in it, and fills it with a smooth Unctuousity; but is perfectly insipid to the Taste, and has generally some hard Particles in it which grit between the Teeth. It is finest of all when most solid and hard to break, when it adheres most firmly to the Tongue, and has most of the greyish Colour among the white. If it be genuine it will make no Ebullition with the very strongest Acids, if thrown into Water it will after some Moments begin to moulder away at the Surface, and finally will totally fall into a white Powder; and if calcined in a moderate Fire, it will become perfectly white, losing all its greyish Colour, and this with very little additional Hardness; which is a singular Circumstance in an Earth naturally so dense and firm.

This Species of Bole seems to have been known many Ages in *Italy*, and is to this Day esteemed a very powerful Medicine: All the *Italian* Writers mention it as a known Remedy for venomous Bites; and *Boccone*, who calls it *Terra Bezoartica*, and though somewhat improperly *Species Terræ Lemniæ*, says much of it in the Cure of Fevers of the worst Kinds.

It is dug about *Macerata* in the Marquisate of *Ancona* in the Pope's Territories; and, so far as is yet known, no where else in the World. Experience shews it to be an Astringent, but this only of a very inferior Kind to many of the Boles. Its other Virtues must rest their Credit on the Authors who have related them.

CHAPTER III.

TERRA LEMNIA ALBA, *White Lemnian Earth.*

THIS is a fine and pure Bole, of a close Texture, very soft and friable, and of a less smooth Surface than the Generality of the Boles. It is sometimes met with in the Shops in small irregularly shaped Masses, easily breaking to Pieces in handling, and consequently in general covered with Dust of their own making; we more usually however meet with it made up into Cakes in Form of thin Segments of Cylinders, stamped with the Impression of a Wreath of Palm on one Side, and of Olive on the other, and with the Words *Terra Sigillata* in the middle. In either Case, for there is no great Trouble taken about the forming it into Cakes, it is less soft and unctuous to the Touch than most of the other Boles; it is very light and appears of a somewhat spongy Structure when broken, and is of a very pure white without the least Mixture of any other Colour.

Applied to the Tongue it adheres very firmly to it, and if taken into the

Mouth melts very readily in it, and is less unctuous and soft there than many other of the Boles, but has no Astringency in its Taste.

The whitest, lightest, and that which adheres most strongly to the Tongue, is to be chosen. If it be suspected not to be genuine, the Tests to prove it are these. A Piece of it thrown into Water, if genuine, begins to break and disunite almost immediately, and in a few Moments falls wholly into a white Powder; if burnt in a moderate Fire it acquires a very remarkable Hardness, and if thrown into the strongest Acids it makes no Sort of Ebullition with them.

It is found in many Places in the Island of *Lemnos*, not in the same Pits with the red and yellow Boles of the same Island, but rising near the Surface. It is not known of in any other Parts of the World, and it will appear very plainly by comparing the Descriptions, that *Boccone* talked very wildly, when he mentioned the Earth of *Nocera* as a Species of it.

It is at present much esteemed in many Parts of the World in Diarrhœas, Hæmorrhages, and malignant Fevers. It seems to have been long known to the World, the very oldest Authors who have treated of these Subjects mentioning it. Its being received into Use as a Medicine is however of much later Date. The *Greeks* used it as we do Fullers Earth for the taking Spots out of their Cloaths, and perhaps it had not been the worse for the World if it had never been employed to any other Purpose. Nothing is more fatal than the relying too much in dangerous Cases upon Medicines of no real Power; and all the Virtue we are able to discover in this is that of a very moderate Astringent.

CHAPTER IV.

TERRA GOLTBURGENSIS, *Earth of Goltberg.*

THIS is a Species of white Bole much more valuable than any of the former, and indeed worthy to be received into general Use in the Shops. It is a soft, tender, and friable Earth, of a less smooth Surface than many of the other Boles, yet not naturally of a rough or dusty one, and though not smooth and unctuous to the Touch as some are, yet it has nothing in it that feels harsh or gritty, but a Part of its Surface readily comes off with the Fingers with rubbing, and stains them of a whitish Colour. We sometimes see it in its natural State in small brittle Masses, which when broken appear of a light, and often of a spongy Structure; but more usually it is met with prepared into Cakes in Shape resembling Segments of a Cone, and marked with the Figure of a Spread Eagle, and the Words *Terra Sigillata Goltbergensis* under it. It is moderately heavy, and in Colour of a dull dusky white, with a Cast of Blueishness or Greyishness in it. If applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it breaks tolerably readily in it, filling it with an unctuous Softness, and leaving a manifest Astringency behind it, with a Mixture of a disagreeable Taste not met with in any other of the white Boles. It is however perfectly pure and free from hard Particles, and does not leave the slightest Grittiness between the Teeth.

The heaviest, the most friable, and that which is of the most astringent
Taste

Taste is to be chosen. If it be suspected of being sophisticated, the following are the Tests to prove it by: If a Piece of it be thrown into Water it begins after a few Moments to crumble on the Surface, and by Degrees falls into a greyish Powder much of the Colour of Milk that has had the Cream taken off. If calcined in a moderate Fire it loses all its grey Cast and becomes of a pure White, and little less hard than a Stone. If put into the strongest Acids it raises no Ebullition with them.

It is dug in many Places in *Germany*, particularly at this Time near *Hasselt* in the Bishopric of *Liege*. The *German* Physicians suppose it to contain some Particles of Silver, and for that Reason call it *Axungia Lunæ*, as they do the brownish yellow Bole of the Gold Mines of *Strigonium Axungia Solis*, but it does not appear that there is any good Foundation for this. They use it as a Cordial and Sudorific in Fevers, and imagine it a certain Remedy for the Bites of envenom'd Animals; but though these are Virtues that we do not pretend to warrant in it, we are certain of its being a noble Astringent, and particularly efficacious in Hæmorrhages, which it may be safely rely'd on alone to cure, if not so violent as to require Things of more speedy Effect, tho' such as the Physician left to his own Choice would not employ.

On Analysis it is found to contain a vitriolic Salt of the Iron Kind.

CHAPTER V.

TERRA ALBA MAGNI DUCIS.

White Tuscan Earth.

THIS is dense, firm, and compact Earth, of a smooth and glossy Surface, and very soft to the Touch: It is sometimes met with in its crude State in the Shops, and is then found in large irregular Masses, not easily broken between the Fingers, but when in small Pieces crumbling to a fine and remarkably soft Powder; when broken these appear of an even and regular Structure, and are neither plated or flaky as many of the Boles, nor cavernous as others: We more usually however see it made up into small Cakes of about a quarter of an Ounce Weight each, in Shape resembling Segments of Cylinders, and mark'd with an Impression of three Trees, an Escutcheon with the Cross Keys in it, and the Words *Terra Sigillata*. It is very heavy, and of a dull dead White where fresh broken, though usually a little yellowish on the Surface where it has been any Time exposed to the Air. Apply'd to the Tongue it adheres very firmly to it, if taken into the Mouth it melts in it after a few Moments, but has nothing of that unctuous Smoothness that many of the Boles have, though it has no harsh or gritty Particle in it, nor has it much Astringency to the Taste.

It ought to be chosen heavy, and not easily broken, yellow on the outside and as white within as can be found. If suspected of being counterfeited, the Characters that are to distinguish it are these: If thrown into Water it is some Time before it begins to break, but as soon as it does it is in a few Moments all seen in a loose Powder. If put into a moderate Fire it burns to a very fine and pure White, but acquires very little additional Hardness, and if mix'd with a strong Acid it raises a slight Ebullition in it.

It has been long known in *Italy*, and found in many Places there, usually at

no great Depths from the Surface: It is now principally dug about *Florence*, where it lies in very thick Strata. It is much esteem'd in Fevers attended with Diarrhoeas. All that we know certainly of it however is, that it is a very slight Astringent.

CHAPTER VI.

TERRA MELITENSIS OFFICINARUM, QUÆ TERRA PNIGITIS DIOSCORIDES,
White Bole of Malta, the Pnigitis of Dioscorides.

THE white Bole which we are to describe in this Place, though call'd in the *German* and other Shops by the Name of *Terra Melitensis*, and brought from *Malta*, is not however the Earth described under that Name by Authors who have written on these Subjects: Their *Terra Melitensis* is an Earth of quite another Genus, a Marl to be described hereafter in its proper Place. This is a true and genuine Bole. It has been described by the Name of *Pnigitis* by *Dioscorides* and others, whence has arisen another Scene of Confusion, this being also the Name of a black Earth of the Clay Kind described by *Galen* and all the Authors since his Time, and mentioned hereafter by us at the Head of the medicinal Clays. The Error of People who sent the *Pnigitis* of *Dioscorides* from *Malta*, supposing it to be the true Kind, first introduced it into the Shops, and the continued Error of those who have used it, not distinguishing that it differed greatly from what they ought to have used, kept its Place there.

It is an Earth of a remarkably compact and firm Texture, and of a very smooth and glossy Surface. We sometimes meet with it in its crude State in large and thick Masses, which are harder to break than those of most of the other Boles, and when broken shew a close, even and regular Structure, with nothing of that laminated or plated Appearance of many of them. It is moderately heavy, and when fresh taken up is of a light greyish not very bright White, but on keeping it acquires a yellowish Cast, and is generally with us of a sort of Cream Colour, though it appears much whiter than on the Surface if fresh broken. We rarely however meet with it in its crude State, the greater Part of what is sent from the Island for medicinal Use being made up into little Cakes of the Form of Segments of a Cylinder, stamp'd with the Impression of a Cherubims Head and Wings, and with the Words *Terra Sigillata* underneath. These prepared Masses however when genuine are nothing different from the crude Earth, as it is evident from Examination that there is no other Preparation given it than the cutting it out and stamping it while moist from the Pit. It does not at all discolour the Hands on rubbing it: If apply'd to the Tongue it adheres very firmly to it; if taken into the Mouth it melts somewhat slowly but perfectly in it, filling it with an unctuous Softness, but has very little Astringency to the Taste, and leaves scarce any hard Particles to grit between the Teeth.

It is to be chosen heavy, hard to break, and yet when in small Pieces easily crumbling between the Fingers, and of a clean White within, though yellowish on the Surface: That which contains the smallest Quantity of hard Particles is also to be chosen, not but that it naturally contains some sandy Matter, but we have met with Pieces of it, even in the crude State, that have been so carelessly
taken

taken up that they have been as harsh as Loam in the Mouth. In general when Earths are intended for medicinal Purposes they ought to be diluted with Water, and all their sandy Particles separated by Subfidence before they are used; and if the sealing them were to express any Thing, it ought to be that this Care had been taken on the Spot, though this is seldom the Case. If this Earth be suspected of not being genuine, it may be proved by the following Tests: if thrown into Water it is some time before it begins to break, but when it has begun it almost in a Moment falls wholly into Powder: If made red hot for a few Minutes in a common Fire it acquires a stony Hardness and much whiter Colour than it had before, and if put into the strongest Acids it raises no Effervescence in them.

It was first discovered near *Pnigeos*, whence it is named, and was used in the Days of *Dioscorides* as an Astringent. It is now found in many Parts of the Island from whence it has its Name, and lies at no great Depth. The *Bufonitæ* and *Glossopetræ*, as they are call'd, that is the petrify'd Teeth of the *Lupus piscis* and the Shark so common in that Island, are frequently lodged in it. It is however but of late Use in Medicine, having succeeded the true *Terra Melitensis* of the earlier Authors by mere Error. It has in the *German* Shops all the Virtues of the other ascribed to it, but with what Justice we are not able to say: They esteem it a Cordial, a Sudorific, and a certain Remedy in the Bites or Stings of venomous Animals of all Kinds: All that we have found in it is a slight Degree of Astringency.

CHAPTER VII.

TERRA ERETRIA, *Eretrian Earth.*

THIS, which is the last we have to describe of the white Boles, is one that very well deserv'd the Notice that was taken of it by the Ancients, and is worthy to be introduced into the present Practice, as universally as it was into that of earlier Ages.

It is a moderately compact and firm Earth, not easily broken when in large Pieces, but when in small Fragments crumbling to a fine Powder between the Fingers: We usually meet with it in large rough Masses, which are of a naturally smooth and glossy Surface, very soft and unctuous to the Touch, and do not discolour the Hands in rubbing: It is considerably heavy, of a whitish Colour with a faint Admixture of greyishness, and usually contracts a dead and somewhat yellow Cast on the Outside. If apply'd to the Tongue it adheres very firmly to it, and if taken into the Mouth it breaks readily in it, and has somewhat less of that Unctuousity which the Boles in general are known by, but has a more manifest Astringency to the Taste than most of them, and is naturally so pure and free from hard Particles that it does not leave the slightest Grittiness between the Teeth.

It is to be chosen heavy, not too White, and of a manifestly astringent Taste. If it be suspected not to be genuine, it may be discovered by the following Characters: When true if thrown into Water it after a few Moments begins to moulder away on the Surface, and gradually falls into a greyish Powder: If
kept

kept red hot a few Minutes in a common Fire it acquires a purer Whiteness, becomes hard as a Stone and of an acrimonious Taste. If put into an acid Menstruum it makes a violent Effervescence.

These are Characters that will serve to distinguish it from all the other white Boles; but there is yet another very obvious one and very easily made, which serves the Purpose alone; this we owe the first Hint of to *Dioscorides*, it is, that if a Piece of this Earth be wetted a little and a Line be then drawn with it on a Plate of perfectly clean Brass or Copper, the Line will after a few Minutes appear blueish.

The oldest Authors that we are acquainted with have mentioned this Earth, and all of them have celebrated it for its medicinal Virtues; they gave it in Fluxes of all Kinds, and in malignant Fevers. They were extremely careful in their Preparation of it, the Process of which is delivered us by *Dioscorides*, and amounts to much the same with our manner of levigating the Testaceous Powders.

It is now dug in the *Negropont* near the Ancient *Eretria*, and might be had in Quantities thence. We have found it to be an excellent alkaline Absorbent, and greatly preferable to Chalk in the Cure of that troublesome Complaint the Heartburn. A Scruple of it given for a Dose has scarce ever fail'd in this Case. On Analysis it is found to yield a small Quantity of that native alkaline fix'd Salt found in many Parts of the East, which the Ancients call'd *Natrum*, and the People of *Smyrna* Soap-Earth, as it is frequently found embodied in Earth there. If the later Writers on these Subjects had been at the Pains to procure the true Earth of this Name, and to make this Experiment, they would have found less Reason to quarrel with the Ancients about their Story of its making a blue Line on Copper, since not only Experience shews it to be a Fact, but Reason would have dictated it also, as this alkaline Salt it contains, like all others, must naturally give a blue Solution of that Metal.

The old Authors distinguish this greyish Eretrian Earth from another Kind which they had in Use among them, and which was of a pure Snow-White. This last Kind seems to have been the same with the white Bole Armenic.

Of B R O W N B O L E S.

THE Writers of the *Materia Medica* have not left us the Name of a single Earth of the Bole Kind of this Colour; but as the *Germans* have of late Years introduced two such into Use in their Shops, and given so good Characters of them abroad, that some other Nations are doing the same, we are not to omit the Description and Characters of them.

C H A P T E R I.

BOLUS PURISSIMA FUSCA,
Deep brown German Bole.

THIS is a very elegant and beautiful Earth, of a dense, compact and firm Texture, not easily broken when in large Pieces, but the smaller Fragments

ments of which readily moulder between the Fingers into an extremely fine and soft Powder. It is sometimes made up into small Cakes and sealed with various Impressions, but more frequently it is sent to the Shops in the rough Masses as it is dug; these are generally of a flattish Figure, of an extremely smooth and glossy Surface, very soft and unctuous to the Touch, and when broken are found to be of a flaky or laminated Structure, each Mass being composed of a Multitude of extremely thin Plates lying very regularly and closely over one another: We have met with Pieces where this peculiar Structure indeed has not been discoverable, but such are rare. It is less heavy than many of the other Boles, and is of a remarkably beautiful brown Colour.

It does not at all stain the Hands in touching it. If apply'd to the Tongue it adheres very firmly to it, and if taken into the Mouth it melts very freely in it, and fills it with an unctuous Smoothness. It is perfectly pure and fine, leaving not the least Grittiness between the Teeth, and has a manifestly astringent Taste. There is no Earth which in the Mouth so much as this resembles the true yellow *Armenian Bole*.

It is to be chosen of the brightest Colour that can be found, not pale or spotted but uniformly ting'd throughout the whole Mass, and such as rubs to the finest Powder between the Fingers. If suspected of Adulteration the Characters by which it is to be proved are these: It makes no Ebullition with the strongest Acids: If thrown into Water it after a few Moments separates into a Number of thin Flakes, and from those falls into a fine deep brown Powder: If heated red hot in a common Fire it crackles and bursts, throwing off many of the Flakes from the Surface, but after this it calcines to a pale red Colour.

It is found in sinking after Mines in the *Harts-Forest*, and in many other Parts of the *German Dominions*: I have received the same Earth also from *America*, and we are not without it in *England*; ours indeed want the laminated Structure of the *German*, but that is accidental: It answers to all the Characters of it on the most rigid Examination: The *American* I have received from the Mountains at the Back of *Virginia*, the *English* is frequent near *Birmingham*, and in some other Places.

The *Germans* who have introduced this Bole into their Shops know it yet by no other Name but the common one of *Terra Sigillata*; they are so well acquainted however with its Figure and its Virtues, that the Gentleman whom I commissioned to collect my Drugs there, informs me few of their Shops are without it, and that they give it in Fluxes and in malignant Fevers; in short, in all those Cases in which Authors have recommended the sealed Earth of *Lemnos*. Whatever Foundation there may be for the Opinion of its being a Sudorific, or a Remedy against venomous Bites, we have the Testimony of Experience that it is an excellent Astringent and very worthy to be introduced into the Shops.

CHAPTER II.

BOLUS PALLIDE FUSCA,
Pale brown German Bole.

THIS is a very firm, compact and close Earth, of a tolerably smooth but not glossy Surface, and very soft and unctuous to the Touch. It is some-
E c times

times met with in the Shops in its crude State, just as taken from the Pit, in which Case it is hard to break, and even in the smallest Fragments not easily rub'd to Powder between the Fingers. It is more usually however found in small Cakes of the Figure of Segments of Cylinders, much broader and thinner than those of the other brown Bole, and stamp'd with any Impression at the Pleasure of the Person who makes them up: There is so little Ceremony used however in the making up of these Cakes, that excepting for the Impression there is no Difference between these and the rough natural Earth. When broken it appears of a very irregular Structure, not laminated as the former, but seemingly composed of a Number of small Masses, not well mix'd or perfectly cohering with one another. It is remarkably heavy, and of a pale brown Colour, variegated with innumerable Spots of White and Yellow of the bigness of small Pins Heads. It does not stain the Hands: If apply'd to the Tongue it scarce at all adheres to it: If taken into the Mouth it very readily melts in it and fills it with an unctuous Smoothness, leaving a very disagreeable Taste behind it, but with no great Astringency in it. It is perfectly pure and free from sandy Matter, and leaves not the least Grittiness between the Teeth.

It is so very singular an Earth that there is no great Danger of its being ever counterfeited, but if it should at any Time be suspected of it, the following Characters will prove whether it be genuine. If a Piece of it be put into Water it after a few Moments begins to moulder away at the Surface, and soon after becomes a Mass of fine pale yellowish brown Powder; if put into the strongest Acids it does not raise the least Ebullition, and if kept red hot a few Minutes in a common Fire it becomes of a deep dusky red Colour with very little additional Hardness.

It is dug in many Parts of *Germany*, and is used indiscriminately with the other under the Name of *Terra Sigillata* in Fluxes and malignant Fevers. This seems however to be a great Abuse, as it does not possess those Qualities in any thing near the Degree of the other, Experience shewing it to be but a very weak Astringent.

Of CLAYS.

WE understand by the Word Clay a native simple Earth, very compact and firm, hard, when dry, but viscid, tough and ductile while moist, very slowly and difficultly diffusing itself in Water, and when blended with it, very soon subsiding from it.

The Kinds of Clay used in Medicine are so few, that it will not be necessary to arrange them according to their Colours as we have done the Boles, it will be sufficient to enumerate them in the order in which they will be described, and thence to proceed to their History. They are, 1. The *Terra Pnigites*, a black one recommended by *Galen*. 2. The *Thyites* of *Dioscorides* which is of the Number of the indurated Clays, and from its Hardness has been called by the Ancients a Stone, and is green in Colour. 3. The *Melitites* of the Ancients, another of the indurated Clays of a yellow and white Colour. 4. The *Galactites* of

of the Ancients of an Ash Colour. 5. The *Morochthus* of the same Authors of a greenish and white Colour, all the three last are like the *Thyites* of *Dioscorides* of the indurated Clay Kind, and have in the same Manner been called Stones by those who have not thoroughly considered their Properties and Characters. 6. The *Steatites* or *Soap Rock* another of the indurated Clays of a white Colour, variegated with green Purple and other Colours. 7. The *Cimolia Alba*, or common Tobacco Pipe Clay. 8. The *Paratonium* of the Ancients, a very white Clay found on the Shores; and 9th. The *Argilla Lemnia*, a brown Clay spotted with black, very different from the *Lemnian* Earths of the Ancients, which we have described among the Boles.

These are all the Species of Clay which stand recorded by the Ancients for their Virtues in Medicine, or retain a Place in the Catalogues of the *Materia Medica*, and of these scarce any one is received into the present Practice. It must be acknowledged indeed, that in general the Earths of the Bole Kind seem fittest for Use in Medicine, and those of the Clay Kind for the Potters. It appears however from Experience, that at least a third Part of what we have enumerated here, deserve to be received upon a better Footing.

CHAPTER I.

TERRA PNIGITIS GALENI,
Pnigean Earth of Galen.

WE are under a Necessity of adding to the Name of this Earth that of the Author, who brought it into Use in Medicine to distinguish it from another very different Earth, which has been described under the same Name by some other of the Ancients, merely because brought from the same Place.

The *Terra Pnigitis* of *Galen* then, is an extremely firm, compact and hard Earth, of a very smooth, even and glossy Surface, very soft to the Touch, and at first Sight by its regular Texture and natural Polish may be easily mistaken for black Marble. It is too hard to be broken between the Fingers, and even in the smallest Fragments will not readily crumble to Powder between them; when broken it appears of a regular and uniform Structure, not plated or composed of *Laminae*, nor spongy and cavernous as many other Earths, but close and even, as if it had been wrought and pressed together while moist. In Colour it is of a fine deep shining black, it is remarkably heavy, and if rubbed ever so much between the Fingers will not impart any Stain to them: applied to the Tongue it does not adhere at all to it; if taken into the Mouth it melts very slowly in it, but fills it at length with an unctuous Smoothness, and leaves a remarkable Astringency on the Tongue. It is perfectly pure and free from any hard Particles, leaving not the least Harshness between the Teeth.

The Characters beside these, which distinguish it from all the other black Earths are, that if thrown into Water it remains a long time before it breaks in it, but at length falls into a fine black Matter. If kept red hot a few Minutes in a common Fire it loses its Blackness, acquiring a pale red Colour in the Place of it, and becomes of an almost stony Hardness: If thrown into the strongest Acids it makes no Ebullition with them.

It was in the Days of *Galen* dug near *Pnigeo*, and afterwards in many of the Islands of the *Archipelago*. It is not however peculiar to that Part of the World, but is met with in the *Saxon* Mines, and in some of the Clay-Pits of our own Country, but it usually lies with us at considerable Depths; we have it in *Worcestershire*, *Staffordshire*, and on the South Side of *London* in many Places.

It obtained its Name from the Place in which it was found in greatest Quantity in *Galen's* Time, but this was so vague a one that it had before been given by *Dioscorides* and others to another Earth of a very different Kind resembling the Eretrian. These not only differ as widely in Colour as white and black, but in their other Characters as much; this *Pnigitis* of *Dioscorides* being remarkable for adhering firmly to the Tongue, and the black one of *Galen* for its not adhering to it at all. They both obtained the same Name, because brought from the same Place, and the Earth of *Dioscorides* called by this Denomination, on examining all its Characters as given us by himself and others, appears to have been the very same with that Bole, which we have lately introduced into the Shops under the Name of *Terra Melitensis*, and which, as has been observed in its Description under the Head of the white Boles, is very different from the Earth those Authors described under that Name, that being no Bole but of the Marl Kind, as described hereafter in its Place.

This however is not all the Difficulty we have to encounter in the History of this Earth; in Regard to the *Pnigitis* of *Galen*, beside the Confusion that is among Authors, some of whom describe a whitish Bole, and others a black Clay under this Name, even those who agree in making it a black Earth, are by no Means agreed as to its Nature and Properties, some of them telling us that it is a mild Astringent, others that it is acrid and almost caustick. To clear up this Difference between Authors who evidently mean the same Substance, though they describe its Qualities so very differently, we are to observe that the vitriolic Pyrites, a Substance containing an acrid Salt, and capable of communicating its Taste to any thing it is embodied with, is very common not only in *England*, but in most Parts of the World in Strata of Clay; both in separate Masses or Lumps of the Pyrites regularly formed, and in loose Particles among the Matter of the Strata. The *Terra Pnigitis* is of itself an insipid Earth, but it is capable of receiving the vitriolic Salts of this Mineral into its Pores, and in Proportion as it does so, or as these Salts get loose by the Matter that contains them being exposed to the Air, the Earth may taste more or less acrid. The Authors therefore who describe it as insipid, and those who speak of it as pungent to the Taste, provided that they both describe it as being black, may always be understood to mean the same thing; nay, the very same Piece of this Earth may be insipid to the Taste while in the *Stratum*, and its Salts lock'd up among the other Matter of the Mineral they make a Part of, and after a few Days being taken up and exposed to the Air, it may be acrid to a very high Degree from the Salts having disengaged themselves during the Exposure.

The very Pyrites itself is tasteless while it lies in the *Stratum*, though after it has been a few Days exposed to the Air, and is covered with Effervescences of the Salt which has now disengaged itself, it tastes as strongly saline as Vitriol itself; this acrid Quality however is foreign to the Nature of the Earth, and whenever it is possessed of it, it should no longer be looked on as the Medicine described by *Galen*. When in its pure State it is a mild Astringent.

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It is recommended as such by *Galen*, and we have proved by Experience that it deserves all that he has said of it. The *English* succeeds as well as the *Grecian*, and in a Country where any thing genuine of the Bole Kind is so scarce as with us at present, it is very worthy to be taken into Use in the Shops.

On a careful Analysis it yields a small Portion of Iron.

CHAPTER II.

THYITES DIOSCORIDIS;
The Thyites of Dioscorides.

THIS is a very elegant and beautiful Substance, of the Nature of those Bodies now generally known under the Name of indurated Clays, and from its Hardness having, like the *Morochthus* and the rest of the Earths of the same Kind, obtained the Name of a Stone, it is generally known under the Name of *Lapis Thyites*, as they are under those of *Lapis Galactites*, *Lapis Morochthus* and the rest; but as Experiments prove it to be a Clay, we have brought it from among the Bodies of that improper Class to its true Place.

It is an extremely compact, firm and hard Substance, of a very smooth and glossy Surface, and very soft and unctuous to the Touch. It is not to be broken between the Fingers as the common Earths, but requires the Assistance of a Hammer or some such Instrument to do it: when broken it is found of a regular and uniform Structure, and remarkably bright and shining. It is very heavy, and is usually met with in Masses of no determinate Figure, or Size, except that they are usually flatted, and seldom exceed four or five Ounces in Weight. Its Colour is an elegant pale green, and is perfectly the same throughout the whole Substance, not disposed in Streaks or Veins, nor even in most Cases, darker and paler in the several Parts of the Mass.

Applied to the Tongue it does not at all adhere to it; it does not melt easily in the Mouth, but after being held some time there, it grows soft and unctuous on the Surface, and manifests an acrid and brackish Taste, which is disagreeable in the highest Degree: it is perfectly pure from any Admixture of sandy Matter, and does not leave the least Grittiness between the Teeth. It does not at all stain or discolour the Hands in rubbing it, but if drawn along a Board or a coloured Paper it leaves a fine white Line.

At first Sight it might be easily mistaken by a Person not conversant in these Things for a Kind of pale green Marble, and if a thin Piece of it be held up against the Light, it will be found to be somewhat transparent: all the other indurated Clays indeed also are so in a greater or lesser Degree.

The Characters, beside what we have already delivered, by which it is distinguished from the other indurated Earths are these. If kept in a common Fire a few Minutes it loses its green Colour, and comes out a pale grey Stone, being very considerably increased in Hardness; if urged by a very strong Fire it runs into a foul whitish Glass, and neither in its crude nor calcin'd State will raise any Effervescence with Acids. The Thing it is most likely to be confounded with is the *Morochthus* or *French Chalk*, as we vulgarly express it, some of the greener Pieces of this Substance approaching toward a Resemblance of it; but in these the green is always disposed in Veins, Clouds, and Blotches,
never

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never regularly diffused thro' the Masses as in the *Thyites* : add that the *Thyites* is more pure and considerably brighter and more transparent.

The ancient *Greek* Writers all agree in telling us, that they had this Fossil from *Æthiopia* ; at present it is found in the perpendicular Fissures of Rocks in the Mines of *Sneberg* in *Saxony*, as also in those of *Goffelaer*, and in some Parts of the *Harts Forest*, in which it sometimes fills up the whole Fissures alone, and often is surrounded on every Side by a Bed of a white Marl of the *Lac Lunæ* Kind ; this gives it a white dusty Surface when first taken up, but it easily rubs off and is always merely superficial, not a Grain of it being ever found blended with the Body of the Mass.

The Ancients used it in Distemperatures of the Eyes, they made a *Collyrium* of it, by rubbing a Piece of it on a hard Stone with some Water, the Friction abrading a Part of the *Thyites* in Form of a fine Powder, that became intimately blended with the Water, and the green Colour not being strong enough to appear in such a Mixture, the whole appeared white and milky ; the Basis of the *Thyites* being a white and fine Clay, much of the Nature of our Cornish Soap Rock : it is remarkable that all the *Thyites* we meet with at present in *Europe* gives this milky Tinge to Water, though ever so green while in the Lump, which is one of the great Characteristics given by *Dioscorides* to the *Æthiopian* Kind in Use in his time, and with the Concurrence of every other Circumstance of his Description, proves that they were evidently both the same Substance.

On Analysis it appears to contain a small Quantity of Copper, to which it owes its green Colour and its Virtues, for it seems to have acted among the Eye Medicines of the Ancients upon the Principle of its being a weak Verdigrase or very diluted Tincture of Copper. The Trouble of an Analysis by Fire is not necessary to the proving that there is Copper in the *Thyites*, for though it has not enough Tincture of its green to impart that Colour to the Water it is blended in, yet it has enough to discover it by the Assistance of a volatile Alkali ; equal Parts of this white Liquor and Spirit of Sal Armoniac being mixed together after a little time standing become blue.

CHAPTER III.

MELITITES,

The Melitites of the Ancients.

THIS as also the three following Substances are all of them of the Nature of the preceding *Thyites* : they are all indurated Clays, and accordingly have all, from their Hardness and compact Texture, been taken for Stones, and called by the Writers in general on these Subjects, *Lapis Melitites*, *Lapis Galactites*, &c.

This is a very compact dense, and firm Substance, less hard indeed than the *Thyites* or *Morochthus*, but more so than any other of the Bodies of this Class ; it is naturally of an extremely smooth and glossy Surface, and so soft to the Touch, that it might be suspected by a Person unacquainted with these Bodies to have been rubbed over with some fat Substance.

When broken it appears of an even and regular Structure, and not composed
of

of Arrangements of any visible Corpuscles ; it is usually met with in small Masses of an Ounce or two in Weight, which are frequently rounded into the Shape of Pebbles : this has been supposed by some to be the Effect of Art, but it is a natural Consequence of their having been rolled about in the Beds of Rivers, and having had their Angles rubbed off by the continual Friction against other harder Bodies.

It is very heavy, and in Colour is of a dead white, with a faint Cast of Greyishness in it, variegated with Spots, Clouds, and Veins of a pale yellow, which are so plentifully blended in most of the Masses, that they leave scarce any of the Ground Colour visible. If wetted it appears somewhat darker coloured and more glossy than before, and if held up against the Light is found to have some Degree of Transparency ; applied to the Tongue it does not at all adhere to it ; if rubbed ever so freely about the Hands it does not discolour them, but if drawn over any coloured Surface it leaves a greyish Line behind it ; if taken into the Mouth it melts very slowly, not even its Surface becoming soft or mucous till after a considerable time ; it then affords a mawkish and disagreeable Taste, which some have called sweet, but which seems not over well to agree with the general Sense we adapt to that Term : if rubbed on a Marble with Water, it soon parts with so much of its Substance to it, that it renders it thick and white like Cream, but with somewhat more of the yellowish Cast than that usually has.

If heated in a common Fire it loses its yellow Colour entirely, becoming of a fine bright white, but it acquires little or no additional Hardness ; when urged by a more violent Heat it runs into a pale blue coarse Glass, but it requires a very strong one to do that.

It was anciently found in *Egypt* and *Æthiopia* ; at present it is not rarely met with in the *German* Mines, filling up Fissures in the Rocks, and often in the Beds of Rivers in *Italy* and in some Parts of *France*. When found in the Earth we usually see it in flat Pieces of various irregular Figures ; but that which is found in Rivers is usually of the Pebble-Shape, rounded, and of a very regular Surface. The Ancients esteemed it a Vulnerary and Narcotic : They ground it down into a thick Liquor with Water, and washed Ulcers with it : They gave it also internally to People who were to suffer Operations in Surgery, which in their Time were terrible enough, in order to prevent their feeling the Pain ; but this seems to have had very little Foundation in Reason. At present it is little known in the World, and where it is found is used for no better Purpose than that of marking in the Manner of Chalk. It obtained its Name from the *Greek* Μέλι, Honey. The old Authors tell us that it was thus called from its having the Sweetness of that Substance, but it seems much more likely to have been so denominated from its Colour, which comes much nearer to Honey than its Taste does.

CHAPTER IV.

GALACTITES, *The Galactites of the Ancients.*

THIS Earth from its Hardness has, like the two former Substances, been used to be called a Stone, and the Word *Lapis* placed before it by almost

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all Authors. The general Mistake about it in this Respect has been the great Reason of its being unknown in the later Ages. People have looked for something among the Stones, which should answer to the Descriptions left to us by the old *Greek* Writers of this Substance, and they might have looked long enough in vain in so wrong a Place. Had they observed that the Characters attributed to it are all of them of the Nature of those attributed by the same Writers to the *Morochthus*, they would easily have been led to enquire after it among the same Set of Bodies, and not long have been at a Loss about it.

It is one of the Species of indurated Clay, and is of a very compact firm Texture, and of a smooth and even Surface, though less glossy than that of the *Melites* or *Morochthus*, and even sometimes dusty in such a Degree as to stain the Fingers in handling. It is however soft and unctuous to the Touch, and when broken appears of the same fine and close Structure with the rest; but it usually breaks very irregularly from certain Cracks that run through it in all Directions, and in which there is often a little Moisture which tinges the Sides of them yellowish. It is usually found in large Pieces, some of them weighing a Pound or more, and is of a dull and disagreeable greyish Colour, without any Mixture or Variegation of the yellow of the preceding Species, or the green of the following one. When wetted it appears much smoother than before, and more glossy, and when held up against the Light is a little transparent. Applied to the Tongue it does not adhere at all to it, and when taken into the Mouth it remains there a long Time without breaking, but at length it grows soft on the Surface, and fills the Mouth with an unctuous Smoothness, and a very disagreeable Taste, though somewhat of the sweet Kind. If heated red hot in a common Fire it acquires a very great additional Hardness, and becomes of a pure and very bright white.

The Ancients who have left us Descriptions of it found it in the Rivers of *Greece* and in the *Nile*, at present it is met with much nearer us. The *Saxon* Mines and Rivers all afford more or less of it, and it is not less common in *Italy* and in some Parts of *France*; but it is not known by any particular Name in any of these Places, but esteemed a somewhat worse Kind of the *Morochthus*. *Dioscorides* tells us of its being in great Use in his Time in Form of a Collyrium, made by grinding it on a hard Stone with Water till it thickened that into the Consistence of Cream: This was one of their great Medicines in Distemperatures of the Eyes and Eye-lids, particularly in Ulcerations of the latter. *Galen* prescribes it also internally as an Astringent, but Experience does not warrant any Thing of this. What the Ancients have said of all the Substances of this Kind as to their being good in Diseases of the Eyes, has led us to make the Trial with this, which is the softest and most easily blended with Water of them all; we have had it ground down upon a Marble, and mixed with Water, in which Case it makes a fine smooth milky Liquor, which in all Inflammations of the Eye-lids, is equal, if not superior, to all the Collyriums we are acquainted with.

CHAPTER V.

MOROCHTHUS,

The Morochthus of the Ancients, called at this Time French Chalk.

THIS is of the same Kind with the former indurated Clays, but it is the hardest and finest of them all. It is of an extremely dense and compact Texture, and of a smooth and very glossy Surface when rubbed. It is very soft and unctuous to the Touch, and when broken appears of an uniform Structure. It is brought to us in Masses, some of them considerably large and of an irregular Figure, though the greater Part are flattish. It is remarkably heavy, and has the same greyish white Colour as the others before described have for its Basis; but this is variegated with a dusky green, disposed in a Sort of irregular Veins and Clouds, and varying in its Degree of Strength or Paleness, not only in the several Pieces, but frequently in the several Parts of the same Mass. If held up against the Light in thin Pieces, it is found to be in some Degree transparent; applied to the Tongue it does not adhere at all to it; taken into the Mouth it melts very slowly, and has an unctuous Softness and very disagreeable Taste.

The Ancients had it with their Galactites and Melitites from *Egypt* and *Ethiopia*. At present the whole World is supplied with it from *France*, where it is found in vast Abundance. We do not at present give any Credit to the Ancients who esteemed it an Astringent and Lithontriptic, and accordingly gave it in Diarrhoeas and Hæmorrhages of all Kinds, and in nephritic Cases. They also used a Collyrium made of it with Water in Disorders of the Eyes and Eye-lids, and this probably with more Success. At present however we know nothing of it, but that it seems to take Spots out of Cloaths more readily than Fuller's Earth, and that it marks better than Chalk, because it leaves a more slender and a more lasting Line, and is more convenient because it does not stain the Hands nor the Things it is laid among.

CHAPTER VI.

STEATITES, QUÆ TERRA CIMOLIA PURPURASCENS ANTIQUORUM,

The Soap-rock, called by the Ancients the Purple Cimolian Earth.

THE Practice of the Ancients of giving no other Names to their Earths than an Adjective derived from that of the Place where they were found, has been an Occasion of great Confusion and Error among those who succeeded them; as there were no Qualities of the Substances recorded by these Names, they were as well applied to one of the Things found in the Place as to another; and even in the earlier Times it has been no uncommon Thing to find two as different Substances as any of the same Class could be, called by Authors at no great Distance of Time by the same Name. For an Instance of this, we need go no farther than to the *Pnigitis Terra*, which, as before observed, was the Name of a white Bole in the Days of *Dioscorides*, and of a black Clay in those of *Galen*. The Word *Cimolia* was of the same Kind, and

was given by some of the old Writers to a fine light and white Marl, used both in Medicine and in the Manufactures, because brought in their Time from that Island. In after Ages another very hard and firm Earth was found in the same Place, and though extremely different from it, was called by the same Name; this was our Steatites, which we call in the West of *England*, where it is also frequent, *Soap-rock*. The remarkable Colour of this last discovered Earth however acquired it the uncommon Favour of an Epithet, *purpurascens*, which was always made a Part of its Name.

The Descriptions the Ancients have left us of this Earth shew it to have been one of the hardest they were acquainted with, and this and its purple Colour so evidently point out the Steatites of our Time to be the same Substance, that it would seem scarce possible for a Mistake to be made about it; yet such has been the Carelessness and Inattention of Authors, both to the Descriptions of the Ancients, and to the Bodies themselves, though ever so frequent among us, that the Name of *Cimolia purpurascens* has in general been given to one of the softest Earths we know, and one as far from Purple as any Thing well can be; the common Fuller's Earth having been generally given us as the Earth the Ancients meant to describe to us under this Name.

The Steatites or true purple *Cimolian* Earth of the Ancients is of the Nature of the indurated Clays, and approaches more to the Galactites and Morochthus than to any other known Bodies, though usually somewhat softer than they.

It is of a compact and close Texture, and of a remarkably smooth and glossy Surface, and by far the most soft and unctuous to the Touch of all the known Earths. The larger Masses of it are often of a somewhat different Structure in their several Parts, being much more hard, bright and glossy in some Places than in others, and in many affording a Sort of irregular Veins, that are scarce inferior in Hardness and Transparency to the Morochthus. It is remarkably heavy, very cold to the Touch, and in Colour is white, veined and variegated with Purple in an elegant Manner, and that in such Plenty that the Purple sometimes makes up the largest Part of the Mass. Though this however is the usual Colour with which this beautiful Earth is variegated, it is not the only one: We meet with a great deal of it veined and clouded in the same Manner with green, and sometimes with yellow, often with a pale red of the Nature of what we call Flesh Colour. It does not discolour the Fingers on handling, but if drawn along a coloured Substance, it leaves, in the Manner of the Morochthus a white Line, and like it if cut into thin Slices and held up against the Light, it is found to be in some Degree transparent.

Applied to the Tongue it does not at all adhere to it, and if taken into the Mouth it breaks very slowly, but at length fills it with an unctuous Smoothness and a very disagreeable Taste, approaching to that which the Ancients have somewhat improperly called Sweetness, in their Melitites. It is perfectly free from any Mixture of hard Particles, and leaves not the least Grittiness between the Teeth. Neither this nor any other of the indurated Clays make any Effervescence even with the strongest Acids, and this like the rest loses its Colours by burning, coming out of the Fire merely white.

The Ancients had it from the Island whose Name it bears among them, and as they inform us also from *Agypt* and *India*. The latter Place we are certain they

they might be very right in giving as one of its *Natalia*, for we have received Specimens of it frequently from thence. We have it however in great Abundance at Home in *Cornwal*, the Islands that lie about that Part of the Kingdom, and more or less in all the Counties thereabouts. It is usually found in the large perpendicular Fissures of Rocks, filling them up though ever so wide; in some Parts of *Cornwal* there have been Loads of it of this Kind discovered of five, six, or more Feet in Diameter.

The Ancients commend it as an Astringent, and later Authors have spoke much of its Virtues in Hæmorrhages. Doubtless it possesses all the Qualities of the Galactites and Melitites and the rest of that Kind, but we have not yet had the astringent Qualities of any of these perfectly ascertained. It was used also among the *Greeks* to take Spots out of their Cloaths, and we find it answers very well at present to the same Purposes. Its great Use however is in the figuline Art, there is all the Reason in the World to believe that it will with some proper Admixtures make a Porcelain Ware like that of *China*. It is certain that the *Chinese* themselves use it in their Works, they have great Quantities of it in their own Country, and have from Time immemorial not only made it one of their Ingredients in some Kinds of their Ware, but have always been used to make what they call one of their Oils with it, that is a thin Varnish like Milk, made by blending it in Water, and used to wash over the Vessels they have made, by Way of glazing.

The *Chinese* Steatites is the same with ours in Texture and all its Qualities, but is usually variegated with a greenish Colour instead of Purple.

CHAPTER VII.

CIMOLIA ALBA OFFICINARUM, *Tobacco Pipe Clay.*

THIS is a very different Substance from the *Cimolia Alba* of the Ancients, which was not a Clay but a Marl, and is described hereafter in its Place: This is an Earth common to almost all Parts of the World, and which has been known in all the Ages we have any Records of, either as a Medicine or in the Manufactures. It is an Earth of a compact and dense Texture, of a tolerably smooth Surface, and very soft and unctuous to the Touch: We receive it in Masses of various Shape and Size, as they chance to fall from the Spade in digging from the *Stratum*. They are easily broken in the Hands, and the small Fragments of them readily moulder to a fine Powder between the Fingers. It is heavier than many of the other Clays, and of a dull dead white in Colour, and usually acquires a Yellowness on the Surface, when long exposed to the Air. Applied to the Tongue it adheres very firmly to it, if taken into the Mouth it melts very slowly in it, and fills it with an unctuous Smoothness, leaving a somewhat disagreeable Taste behind it, and some hard Particles which grit between the Teeth. If thrown into Water it remains a long Time in it without breaking, but at length moulders into a white Powder. It raises no Sort of Effervescence with any Acid, and on being calcined, acquires a great Hardness and a whiter Colour, as we see in the daily Instance of the Pipes made of it.

Let it not seem impertinent that we have given the Characters of so obvious and common a Body as this, as regularly as those of the more scarce ones; they will serve not only to distinguish it under its common Appearance, but to point it out where more disguised and made Use of in Adulterations of our medicinal Earths.

The Ancients unquestionably had this in many Places among the other white Earths, but they could never be tempted to use so coarse an Earth in Medicine, while they had such a Multiplicity of other finer and more valuable ones for that Purpose. They probably used it however in common with the white *Lemnian* Bole, and several other Earths of the same Colour to clean woollen Cloaths.

We find it in vast Abundance in many Parts of *England*; the finest we have however is that of the Isle of *Wight*. It is employed to various Purposes in Life, but is not received under its own Name among us as a Medicine. The Villany of the People who deal in Drugs makes us however use it almost continually, as it is the common Matter used in the Sophistication of all the other Earths.

Some Years ago, when the sealed Earths were in more Use, it stood in the Place of all the white ones, our Druggists cutting it out while wet into various Forms, and stamping the Parts of the same common Mass with the several Names of *Terra Lemnia*, *Terra Goltbergenfis*, *Terra Sigillata vera*, and the rest. Instances of the Truth of this may be found in most of our old Druggists Shops, where if *Terra Sigillata* be enquired for we shall not fail to meet with Tobacco Pipe Clay, stamp'd with several of these sounding Titles.

The Druggists of the present Age are not a whit behind Hand with their Predecessors in this respect: tho' the sealed Earths are at present a good deal out of Use, having lost their Credit long since by these Sophistications, Bole Armenic is a Name that they are frequently asked for a native Earth under, and what is generally sold under the Name of this valuable Earth, is this same grand Sophistication of the Earths tinged to a proper Degree of Redness with that kind of Ochre sold at our Colour Shops under the Name of Spanish Brown. We do not charge the Druggists of *London* with preparing this themselves, but surely it is little less blameable in them to buy it of People who they know make it thus, at least who they must know do not import it, but prepare it of Ingredients they find at home.

Beside the Uses of this Earth, which is thus forced upon us under counterfeit Names as a Medicine, and its common Offices in the more ordinary Affairs of Life, it serves the Chemists in a very remarkable Manner in the preparing some of their acid Spirits; that of Nitre for Instance is very easily forced out by Means of this or any other Earth of the like Kind, while the crude Salt alone will not be made to part with it however the Fire be managed. The Secret of this odd Phænomenon is, that Nitre when once melted, which it does with a very moderate Fire, will not receive any farther Heat, and that requisite to the fusing it being by no Means sufficient to the separating its Spirit from it, it will remain ever so long in that State in the Retort, and never send a Drop of Liquor into the Receiver. It is necessary therefore in order to the obtaining the Spirit from Nitre, that it be heated much more than it is when in Fusion. This is to be done by Means of adding some Substance almost incapable of Fu-

sion to it in a large Quantity, and this and the like Earths are found to answer that Purpose. We find by Experiment that Nitre not only in the Retort, but in a Crucible, tho' it melt alone with a gentle Heat, and in its State of Fusion emits no Vapours, however the Fire is encreased, yet if put in in Powder and carefully mixed with three or four times its Weight of this Earth, it bears a much greater Degree of Heat, does not melt in it but fumes violently, emitting an acid Vapour which almost suffocates if it come in the way of the Breath, and in fine is almost entirely rarified in this Manner and sent into the Air. It is evident that if a Receiver were fixed to the Mouth of the Crucible, in this Case this Vapour would be condensed in it in Form of the acid Spirit of Nitre, and that therefore all that is done by this Earth, or any other the like Substance in the Distillation, is only the preventing the Salt from melting, and by that Means rendering it susceptible of a much greater Degree of Heat. We are sensible that the Generality of our Chemists use what they call Bole Armenic for this Purpose, but we have already observed, that that is only Pipe Clay under another Form and Name; any dry Earth will answer the same Purpose, common Clay or Brick Dust serve as well as any thing, but it is remarkable that what has been once used on this Occasion will not serve the same Purpose again, tho' ever so carefully washed and reduced to its originally insipid State again.

CHAPTER VIII.

PARÆTONIUM,

The Parætonian Earth of the Ancients.

THIS is by much the purest and finest of all the Clays we are acquainted with: it is of an extremely close and compact Texture, tough and viscid to a very great Degree while moist, and when dry'd of a smooth, even and glossy Surface, considerably hard, soft and unctuous to the Touch and very heavy; it does not at all discolour the Fingers in handling it; it is not easily broken while in large Masses, but its smaller Particles are very freely and readily rubbed to a fine Powder between the Fingers. It is in Colour of a very fine and clean white when pure, but it is liable more than almost any other Earth to have extraneous Foulnesses mixed among it: applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it by Degrees melts into an unctuous Substance of an astringent Taste.

The Characters, beside those given in the Description which serve to distinguish it from the other white Clays, are, that it is highly alkaline and raises a very violent Effervescence with any of the stronger Acids; that if thrown into Water it very slowly diffuses itself, but in fine becomes a fine white Matter like Cream, and that if put into the Fire it bursts, and throws off several Pieces from its Surface, but at length is calcined to a snowy Whiteness and to the Hardness of a Stone.

The Ancients tell us that it was found on the Shores of *Ægypt*, and those of the Island of *Crete*; at present it is frequent in large Masses on those of almost all the Islands of the *Archipelago*, wherein rolling about by the Motion of the Waves, it commonly picks up a large Quantity of Fragments of Shells and Sand,

Sand, but these are easily separated from it again by diluting it with Water. We have several Places on the *British* Shores, where Masses of moist Clay of the common Kinds are rolled about continually; these have all been washed out of the Strata in the Cliffs in high Tides, and afterwards rounded by the Motion of the Waters, and in all Probability the Lumps of the *Parætonium*, so frequent on the Shores of the *Archipelago*, have the same Origin, tho' no Body has given us any perfect Account of it.

The Ancients in general used this Earth only as a white in Painting, but it deserves to be recorded for a nobler Quality; it proves on Experiment to be an Astringent of the very first Class, and little inferior to the true *Oriental* Boles.

On Analysis it is found to yield a small Quantity of a vitriolic Salt, and usually a larger Portion of the common Marine Kind, but this last is owing to its being washed by the Sea Water, and ought to be separated from it by washing before it is used as a Medicine.

CHAPTER IX.

ARGILLA LEMNIA, *Lemnian Clay.*

THIS is an Earth lately received into Practice in the *German* Shops, and in some of those of the Persons of the same Nation established in *England*. It is extremely different from all the Kinds of *Terra Lemnia*, mentioned by Authors both in its Origin and Structure, those being all Boles, and this one of the indurated Clays; and we are to add that it greatly merits the Notice that has been taken of it, and that it were to be wished that it might be brought into general Use among us. It is a very hard and firm Earth, of a close, compact and dense Texture, but not a very firm Structure in the whole Masses, being usually full of Cracks and Flaws in various Directions: it is of a very smooth and glossy Surface, extremely soft and unctuous to the Touch, and is usually met with in small irregularly figured Masses, from the Size of a Pea to that of a Walnut, very few of them exceeding that Standard. It is less heavy than most of the Clays, and in Colour is of a very fine and elegant pale brown, veined and clouded with a deep black, and when held up against the Light in thin Pieces it is somewhat transparent.

Applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it slowly but perfectly dissolves in it, leaving not the least Grittiness or Sensation of hard Particles between the Teeth, and is of a manifestly astringent Taste: if thrown into Water it is a considerable time before it breaks or disunites in it, but at length it moulders away into a fine Powder; it makes no Effervescence with the strongest Acids, and on calcining in a common Fire, it acquires a deeper Colour and a very great additional Hardness. The black Veins and Clouds disappear after this, and there are frequently Cracks and Openings seen in the Place of them, if the calcined Masses be carefully examined. This is not wonderful as these Spots are not real Stains in the Matter of the Earth itself, but are in general no other than thin Crusts of a blackish Matter, which have lined the Sides of the little accidental Fissures of the Masses.

It is found in the Island of *Lemnos*, and so far as we know in no other Part of

of the World. It does not lie there in a *Stratum*, but is found in the Fissures and Cavities of some Rocks in the Sides of the Hills there. The Ancients seem to have been wholly unacquainted with it, and 'tis probable that we owe our Knowledge of it to some Person who finding it in *Lemnos*, supposed it to be the Earth of that Island so long celebrated as a Medicine. Experience proves it to be an Astringent equal to almost any that is at present known among this Class of Bodies. I have given it with great Success in Diarrhoeas of the worst Kind, and hear an excellent Account of it among People whom I have encouraged to use it.

It is a very remarkable Earth in its Nature and Qualities, its Place of Origin is the same with that of all the other indurated Clays that is in the Fissures of Stone; it agrees with them in Hardness, Transparency, and many other of their Qualities, but it has an Astringency which they all seem to want, and it is remarkable for adhering firmly to the Tongue, whereas they do not at all.

On Analysis it is found to yield an inconsiderable Quantity of Iron.

Of M A R L S.

WE understand by the Term Marls, Simple Native Earths, less heavy than the Boles or Clays, not soft and unctuous to the Touch, nor ductile while moist, dry and crumbly between the Fingers, and readily diffusible in Water.

The Ancients introduced many of the Earths of this Genus into Use in Medicine, but they confined themselves wholly to the white ones; the yellow, red and blueish, which were not less known among them, were all left to the Use of the Farmers and employed in Agriculture.

The white Marls which the old Authors have left recorded for their Virtues under the several Names given them principally from those of the Places whence they obtained them, are these. 1. The *Terra Cimolia*, an Earth very different from that which we generally call by that Name, which is the common Clay of which Tobacco Pipes are made. 2. The *Terra Melitensis*, or true *Malta* Earth, a Substance not less different from what we generally see under its Name, which is not a Marl, but a Bolé described in its Place. 3. The *Terra Samia*, called *Collyrium Samium*, a soft, white and very friable Marl. 4. The other *Terra Samia*, called *Samius Aster*, a somewhat browner Kind. 5. The *Terra Chia*, a white and very soft and tender Kind. 6. The Earth called *Creta Seleneusiaca*, a very light Kind now known by the Name of *Mineral Agarick*, or *Lac Lunæ*. 7. The *Melinum* of *Pliny*, famous for its Use in Painting, as well as in Medicine; and 8. The *Creta* or common Chalk. To these may be added among the Number of Earths unknown to, or disregarded by them, 9. The *Marga* of the modern Shops, a Kind of *Medulla Saxorum*. 10. The *Rubrica Fabrilis*, or common Reddle used in marking, and sometimes as an Astringent; and 11. The *Terra Saponaria*, or *Fuller's Earth*, all which retain their Place in Catalogues of the *Materia Medica*, tho' very little used.

CHAPTER I.

TERRA CIMOLIA ALBA ANTIQUORUM,
The white Cimolian Earth of the Ancients.

NO one of the ancient Names of Things has been more misapply'd by the late Writers than this of the *Cimolian* Earth, they have left us Accounts of two Kinds of it, and have described both of them very well under the Name of a purple and a white Kind ; the former is what we call *Steatites* or the Soap-Rock, and the latter this Earth to be here described, which is not at all known in its native State in this Part of the World : but the Writers of late Ages have all agreed in telling us that the *Cimolia purpurascens* is our Fuller's-Earth, and the *Cimolia alba* of those Times our Tobacco Pipe Clay. The purple *Cimolia* we have already described in its Place among the indurated Clays.

The white Kind is an Earth of a lax and friable Texture, and of an uneven and rough Surface, not smooth or unctuous to the Touch in the manner of the Boles. It is easily crumbled to Pieces between the Fingers, and somewhat stains them in handling. Though of a less dense Structure than many other Earths it is yet considerably heavy. Its Colour is a dull and dead White ; if moisten'd into a Paste it does not become at all tough or viscid, but continues as friable as while dry ; and whether in this or in its dry State always breaks with a rough uneven Surface. Apply'd to the Tongue it adheres very firmly to it ; and if taken into the Mouth it melts very readily in it, has no disagreeable Taste, but leaves a harsh gritty Matter between the Teeth.

The Characters beside those already deliver'd, which may serve to distinguish it from all the other white Marls, are these : If thrown into Water it makes a hissing Noise, and sends up many Air Bubbles to the Surface, and in a few Moments breaks in it, and falls into a whitish thick Matter like Cream, leaving a little of a fine white Sand at the Bottom. It is this which gives it the Harshness between the Teeth, and this is easily separated in this manner, by dissolving the Earth in Water.

If calcined in a moderate Fire it becomes of a much purer and brighter White than before, and if mix'd with any of the Acids it raises a violent Effervescence. The Ancients had this Earth from the Island whose Name it bears, which is one of those of the *Archipelago*, and is since call'd *Argentiere* : It is not however peculiar to that Island alone, but is found in *Siphanto* and several of the others. It easily discovers itself to the People who search after it, as it seldom lies more than a Foot deep, and often at the Surface. They used it externally in the Erysipelas, and when mix'd into a Paste with Vinegar in Swellings, in Inflammations and Luxations ; but the principal Use they made of it was in the Way in which we use the Fullers-Earth to take out Grease from Cloaths.

Nothing can be more evident than that this Earth now found in the ancient *Cimolus* is the white *Cimolian* Earth of the old *Greeks* ; all their Accounts agree with it, and yet more strongly do they prove that the purple *Cimolian* Earth was as we have observed the *Steatites*. *Galen* says it was purple and unctuous ; and *Dioscorides* that it was flattish and cold to the Touch ; to which *Pliny* adds, that

that it was almost as hard as a Stone. These Characters all agree very well to the *Steatites*, and to no other Earth in the World, and by way of farther Confirmation we may add, that the *Steatites*, the same with that of *Cornwall*, is now found in this and the adjacent Islands in the Cracks of the Rocks, in some Places in very considerable Quantities.

CHAPTER II.

TERRA MELITENSIS ANTIQUORUM,
The Maltese Earth of the Ancients.

THIS is another of the white Earths of the Ancients, the Name of which only remains to us in the Shops, and that applied to another Earth of the Bole Kind described in its Place. Was known to the Ancients under the Name of the white *Pnigitis*, or the *Pnigitis* of *Dioscorides*; a black Clay described also in its Place, having been the *Pnigitis* of *Galen*, and of the Authors who have written since his Time.

These are Errors of at least as much Consequence as the Knowledge of the Substances themselves, since the Use of the Writings of the Ancients who try'd and constantly used them, can be nothing to us if we are not perfectly ascertained of what they meant to express by the Names they have left us. It will appear by the short Disquisitions we have occasionally added at the Beginning or End of the several Chapters, how much the late Authors who have treated of these Subjects have left us in the Dark about them, while provided they had, before they sat down to write, been at the Pains of procuring Specimens of them, which I have found a possible thing to be done, from the very Places whence the Ancients had them, nothing would have been easier than by the help of these and of their Descriptions of them, which are in general very good ones, to determine in every Case what was the Substance known by any particular Name, and of which particular Virtues have been recorded, and whether it be known at this Distance of Time by the same Name or by some other.

The true *Terra Melitensis* of the Ancients is an Earth of a lax Texture, and of an uneven and somewhat dusty Surface, dry but not harsh to the Touch, and staining the Hands when rubb'd against them or when rudely handled. It is met with in the Island in thick Strata, whence it is dug in large irregular Pieces, and when dry is soft and friable, easily broken between the Fingers, and always leaving a ragged uneven Surface. It is remarkably light, and in Colour is of a dusky greyish white, sometimes with a faint Cast of a dull Yellowishness in it. Applied to the Tongue it adheres very firmly to it; if taken into the Mouth it melts very readily in it, and has somewhat of a disagreeable Taste. It is not pure, but usually leaves a great deal of harsh gritty Matter between the Teeth.

The Characters that distinguish it from all the other white Earths are these: If thrown into Water it makes a slight hissing Noise, sends up a Number of Air Bubbles, and soon after swells to a much larger Bulk than before, after which it sinks into a Mass of a loose white Powder, and leaves at the Bottom a Quantity of a fine white Sand. Put into Acids it raises a slight Effervescence, and is in Part dissolved; and calcined in a moderate Fire it becomes of a pure Snow White.

It is found in the Island of *Malta*, and no where else, so far as we know, in the World; it rises near the Surface, and is one of the common Strata of the Island. It has been long esteemed a Remedy for the Bites of venomous Animals, and has been much extolled by some in Diarrhœas and Hæmorrhages, but we much suspect these Virtues in it. We have only try'd it as an Astringent and that with but little Success.

CHAPTER III.

TERRA SAMIA ALBA, QUÆ COLLYRIUM SAMIUM DIOSCORIDIS,
The white Samian Earth, or Collyrium Samium of the Ancients.

THIS is a very singular and remarkable Earth: It is not lax and spongy as most of the medicinal Marls are, but of a close and compact Texture, and of a tolerably even, though not smooth or glossy Surface. Its close Texture does not render it any more hard than the rest of the Earths of this Class: It very readily breaks between the Fingers, and that with an irregular Surface. It is remarkably light, and in Colour of a fine elegant and bright White, and is usually full of small Cracks at which it breaks on a Fall or a slight Blow, and is a little less White on their Sides than elsewhere. It does not stain the Hands in touching, but if drawn along a colour'd Surface of any Kind it leaves a fine and slender white Line. Applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it by Degrees breaks in it and fills it with a soft Unctuousity, and is so free from hard Particles that it does not leave the slightest Grittiness between the Teeth.

The Characters, beside those given in the Description, which serve to distinguish it from the other white Marls are, that if thrown into Water it sends up a few Bubbles with a soft hissing Noise, and remains some time unalter'd in it, at length it begins to moulder away at the Surface, and after this in a few Moments falls wholly into a Mass of a white Powder; it raises not the least Effervescence with Acids, and that on Calcination in a common Fire it becomes very hard and of a pure snowy White.

It was found in the Times of the Ancients in the Island of *Samos*, not constituting regular Strata but lodged in large Quantities in the horizontal Intervals between the Strata of Stone. We do not at present know of it in any other Place beside this Island, and all that have seen it testify the same Thing of it as to its manner of lying in the Earth. Its Structure and Fineness indeed might make one suspect this, as it is plainly one of those Kinds of Earth which from their being found in the Crevices of Stone are call'd *Medullæ Saxorum*. It is found in considerable Plenty in many Parts of the Island, and fills as well the perpendicular Fissures as the horizontal Chasms in the Strata of a grey Stone there.

The Ancients used it externally in Inflammations of all Kinds, and gave it internally as an Astringent in Diarrhœas, Dysenteries and Hæmorrhages; nor was its Use confined to the Province of Medicine alone, they made it enter into their Potteries, and the finest earthen Vessels used at their Feast and Sacrifices were made of a Composition in which this Earth was an Ingredient. At present it is very little known and less used, though it proves upon Experiment to be
worthy

BROWNISH-WHITE SAMIAN EARTH. 227

worthy some Notice as an Astringent. The Writers on these Subjects, as well ancient as modern, are a little confused about the Application of the Names of this and the following Species of *Samian* Earth; but *Dioscorides* describes them both very well, and fixes the Name of *Collyrium Samium* on this white Kind, and that of *Aster Samius* on the brown to be next described.

CHAPTER IV.

TERRA SAMIA ALBOFUSCA SCINTILLANS, QUÆ SAMIUS ASTER DIOSCORIDIS,
The brownish white Samian Earth, the Aster Samius of Dioscorides.

THIS Earth is called by Authors by the same general Name as the former, because brought from the same Place, but it is in its Nature, Origin and Qualities as different from it as it is well possible for one Earth to be from another.

This is of a loose and incoherent Texture and naturally of an uneven Surface, not soft or unctuous to the Touch, but rather harsh and dusting the Fingers in handling, though that Dust does not adhere to them so as properly to be said to stain them, as many of the more unctuous Earths do. It is not to be expected, as sent over to us, to be found in large Masses, since every little Blow is sufficient to break it even in its firmest Pieces. What we see however is usually in flat Cakes, which is owing to its peculiar Structure, it being always form'd of a multitude of thin Flakes or Layers, disposed in a not very regular manner one over the other. For this Reason also it splits flatwise much more easily than in any other Direction, though the natural Friability of its Parts, and the uneven Disposition of the Flakes that are composed of them prevent it ever shewing a smooth Surface where divided in this manner.

It is moderately heavy, of a pale whitish brown Colour, and is spangled all over with little glittering Particles, which, when separated from the rest, are found to be irregular Fragments of the Selenites of the same Kind, with the flat Species so frequent with us about *Oxford*, and in the Plaister-Pits about *Paris*.

Applied to the Tongue it adheres very firmly to it, and if taken into the Mouth melts very readily and easily in it, and has a manifest Astringency in its Taste, but it leaves a double Sensation of extraneous Particles between the Teeth; those of the selenitic Kind feeling soft between them, though they will not break like the Particles of the Earth itself, and there being beside these some other hard and gritty ones which manifest themselves by their Sharpness to be of the Nature of Sand.

An Earth so little known as this is in no Danger of being sophisticated in the Shops, nor indeed were it more common there would its peculiar Structure suffer a Cheat of that Kind to be easily play'd: If any of it found in the Cabinets of the Curious be suspected not to be genuine the Method of trying it is this: If a Piece of it be thrown into Water it raises no Bubbles, nor makes any thing of that hissing Noise that many other of the Marls do, but almost instantaneously swells in Bulk, and begins to separate into the Flakes that it is composed of, and soon after moulders from them into a fine Powder. Calcin'd in a moderate Fire it loses its brownish Hue, but acquires some Cast of Grey in the Place of it, and comes out of a pale Ash Colour: Put into the

strongest Acids it raises no Effervescence in them; and finally if its Parts be separated by means of Water, and the Mixture after shaking left to settle in a tall Vial there will be found three Sediments, a very small one at the Bottom consisting wholly of the hard Particles which are a fine white Sand; secondly, a somewhat larger Quantity of shining flaky Matter, which proves on Trial to be Selenites, not Talk as has been supposed by some, for it calcines in a very gentle Heat, and before that Operation has no Elasticity, which with the Singularity of its resisting the Force of Fire are the Characteristics of Talk; and above both these Sediments is that of the Earth itself, which by repeated Washings of this Kind will become perfectly pure, and will be as soft as the finest *Oriental Bole*.

It is found in the Island whence it has its Name among Beds of Stone: not properly in the Fissures of Strata, for the Stones it lies among do not form any; they are a kind of large and flat Fragments of a soft Stone, of a pale brown Colour, and there are several Ranges of them, between which this Earth lies in a kind of discontinuous horizontal Stratum. The old *Greek* Writers tell us of great Difficulties that the Workmen labour'd under in procuring the white Samian Earth, as they were forced to follow it between the Fissures of the solid Strata, and to lye flat on their Backs or Sides as they pick'd it out: But no such Trouble was necessary about this other Kind, for it was only necessary to remove the Stones which were in a manner ready form'd for building with, and they might take it up in large Quantities. It stands recommended as an excellent Astringent, and on Trial is found to deserve some Praise on that Account; but it is so much inferior even in that Respect to many of the *Oriental* and even to some of the *European* Boles, that it would be idle to attempt the bringing it into Use.

On Analysis it is found to contain a small Portion of that alkaline Matter which is the Basis of Sea-Salt, for though this be not enough in Quantity, or be too strictly united with the rest of its constituent Matter to manifest itself by effervescing with Acids while in its mix'd State in the Earth, if Spirit of Sea-Salt be pour'd on this separated Matter, true Crystals of Sea-Salt of their proper Form will be produced, and that fairer and in larger Proportion than it could be done by means of any other Alkali of whatever Kind.

CHAPTER V.

TERRA CAIA.

Chian Earth.

THIS is another of the medicinal Earths of the Ancients, the Name of which is preserved in our Catalogues of the *Materia Medica*, but of which nothing more than the Name has been known of many Ages in the Shops.

It is a very dense and compact Earth to Appearance, yet its constituent Particles are so ill form'd for cohering, that though they seem laid as closely and regularly together as in any Earth we know, the whole is but a very brittle and shattery Mass. What has been sent over hither of it has all been in small flat Pieces, which when nicely examin'd exhibit plainly enough the Reason of their having that Figure, as they are composed of innumerable thin Flakes or

Laminae

Laminae like those of the last described Earth, laid horizontally over one another, and therefore disposing the Mass to separate much more easily at their Commissures, than in a Direction by its breaking, in which they must be all separated in their whole Substance.

Though this Earth agrees however with the former in its being composed of numerous *Laminae* or Plates, it differs very widely from it in that they are all laid perfectly smooth and even, so that wherever we see a natural horizontal Surface of this Earth it is a flat and even one. It is not of the glossy Surface of the finer Earths of the Bole Kind, but is as soft to the Touch as the very finest of them, and easily moulders between the Fingers to an impalpable Powder, and does not at all discolour the Hands. In Colour it is approaching to white, but has somewhat of a Cast of grey among it. Applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it very freely and readily melts in it, and is perfectly fine and free from hard Particles of any Kind, but has very little Astringency to the Taste. If a Piece of it be put into Water, it sends up a Number of Air Bubbles with a slight hissing Noise, and after a little Time swells in Bulk, and then separates into a Number of thin Plates, from which it falls into an impalpable Powder. If calcined in a moderate Fire it acquires very little additional Hardness, but becomes of a fine and clean white Colour, and if thrown into any Acid, it raises a very violent Effervescence with it.

The Ancients found this Earth in the Island whose Name it bears, and in which it is found in great Plenty to this Time. Indeed our Ignorance of a great Part of the *Materia Medica* of their Times is owing to our own Indolence and Inattention. Most of the Places from whence they had their simple Medicines are found to produce them still, and that in as obvious a Manner as they probably were in their Time. For we are not to suppose that they were at any great Pains to find them. Their Descriptions of the Bodies themselves are generally as faithful as their Accounts of the Places where they are found, and will leave us, in most Cases, no Room to mistake one of them for another. In Regard to this particular Earth which is as little known as any of them, *Galen* tells us, that it was always brought to them in flat Pieces and was white, but not of a clean pure white, but had a Mixture of grey with it; and *Dioscorides* tells us farther, that it was ash-coloured and of a plated Texture, or composed of thin Crusts. An Earth found in the very Place whence they had their *Chian* Earth, and answering to all these Characters, cannot be suspected to be any other than the true Kind; and as easy has it been to me, by the Correspondencies I have established, within the Course of ten or a dozen Years, to procure all their other Earths, as certainly and as obviously the very same with those they used as this. It stands recommended to us as an Astringent, but it does not seem to possess that Quality in any Thing like the Degree of many of the other Earths, especially of some of those of the Bole Kind, and therefore would not be worthy introducing into Practice on that Account. There is however another Intention in which, if it come up to the Character the Ancients have given of it, the Druggists of an Age like this will find it extremely worth their while to import it. They tell us it is the greatest of all Cosmetics, and that it gives a Whiteness and Smoothness to the Skin, and prevents Wrinkles beyond any of the numerous other Substances that have been celebrated for the same Purposes.

On separating its Parts by Water, it is found to contain beside its earthy Matter, a fine sparry Substance as soft and impalpable to the Touch, as the earthy Particles themselves. It would be easy to guess that this sparry Matter is that which ferments with Acids when the Earth is thrown into them, and it is a Conjecture supported by Experiment; for if a sufficient Quantity of the Earth be thrown in to saturate the Acid, and the Solution be afterwards set to shoot, the dissolved Matter will recrySTALLIZE, and shew itself on the Sides of the Vessel in minute Particles, which when examined with a good Magnifier are found to be trigonal Pyramids; the most usual Form of Spar.

CHAPTER VI.

CRETA SELENEUSIACA,
Seleneusian Chalk.

THE Name of Chalk given by the Ancients to this Species of Marl, has led some into an Opinion of its being more nearly allied to our common Chalk than it really is. All that the People who gave it this Name meant to express by it, was probably that it would draw white Lines in the Manner of that Earth; though as they are both of the same Class of Earths the giving the same common Name is the more pardonable.

The general Form under which we meet with this Earth, is that of a very lax and incoherent Mass, breaking indifferently in any Direction, and therefore not falling into the naturally flat Form of the Pieces of the other Marls we have just described: It is in these Pieces of a rough and dusty Surface, staining the Fingers in handling, and marking any thing it is drawn along with a coarse white Line in the Manner of Chalk. Though not soft and unctuous to the Touch, it is however perfectly fine, and readily falls into an impalpable Powder on being rubbed between the Fingers. When broken it appears of a somewhat spongy Structure, in Colour it is of a fine pure and bright white, and its Weight is less than that of most of the other Earths even of this light Kind. Applied to the Tongue it adheres to it, but less firmly than many other Earths, and if taken into the Mouth it readily melts into a soft and unctuous Substance in it, and is so fine that it does not leave the least Grittiness between the Teeth.

After having given these Characters of the *Seleneusian* Earth of the Ancients as it appears in its most usual Form, it remains to observe, that it is frequently found in many others; sometimes we meet with it in small, hard, and compact Lumps, and very often on the contrary in a mere loose impalpable Powder. It never forms a *Stratum* in the Earth, but is always found in the horizontal Cavities between the Strata of the fissile Stones, or in the perpendicular Fissures or accidental Cracks of the other Kinds; in fine wherever there is a Crack or Crevice in a solid Body, it is a Chance but this Matter is found in it. We have even met with it lining the Cracks in the harder Kinds of Clay while in the Strata, and sometimes insinuating itself between the coarser Matter of the *Septaria* or *Ludus Helmontii*, as it is commonly called, and its finer sparry *Septa*. When it is found in the horizontal Cavities, or in the larger perpendicular Fissures of Strata of Stone, it is usually met with in the Form

we have described as its most general one: When it fills smaller Cavities it seems closer pressed together, and becomes harder by that Means; and when the Cracks are so small that it cannot form itself into Masses in them, it then fills them up in Form of Powder, and flies off in a white Dust, when they are broken in these Places. In which ever of these various Forms it offers itself to the curious Observer, it will be known to be the true Substance by its raising a very considerable Effervescence with Acids, by its burning to a yet purer white than it had before, in a common Fire, by its very difficulty running into Glass in the most intense Heat, and by the greenish white Colour of that vitrified Matter. To which may be added, that when in a solid Form, if thrown into Water, it readily diffuses in it, and is so fine that it remains suspended in it on the least Motion, and gives it the Appearance of Milk.

The Ancients received this Earth from some Parts of *Sicily*, where the finest in the World is found to this Day; but the later Authors who have described it under the Names of *Stenomarga*, *Medulla Saxorum*, *Marga feroensis*, *Agaricus Mineralis*, and *Lac Lunæ*, according to the different States in which they met with it, have given us many other Places for it. Indeed it is more or less frequent in all Countries where there are Quarries of Stone, and though it has not been observed that this Substance is evidently the same with the *Seleneusian* Earth of the Ancients, by the Authors who have described it, their Accounts of it, as well as our Examination of the Bodies they mean by those Descriptions, very plainly prove that it is so. *Dioscorides* tells us that their *Seleneusian* Earth was light, friable, of a bright and shining white Colour, and that it very readily diluted and diffused itself in Water; and all that have succeeded him have used his Description, almost his very Words, every Part of which perfectly correspond with the Earth we now meet with in the Place from whence it was brought in their Times, and which is evidently in all Things the same with this *Stenomarga*. Nay the Properties and Qualities of the Earths agree as well as their Descriptions: The Ancients used their *Creta Seleneusiaca* as an Astringent, and sold it to the Ladies as a Cosmetic, and the modern Writers in general allow an Astringency to their *Stenomarga* or *Lac Lunæ*, and in particular Doctor *Plot*, who seems to have had no Idea of its being the same with the *Seleneusian* Earth of the Ancients, tells us from his own Knowledge that it is an excellent Cosmetic. As to its Astringency it is scarce worth our Notice, unless as joined to an alkaline Quality, which may make it more proper in particular Cases than the other Earths of that Kind, though in this it is greatly inferior to some of the yellow Boles: As to the latter Quality ascribed to it, its great Whiteness and peculiar Softness seem to qualify it as much as any Earth can be qualified to deserve the Applause it receives from this Author.

CHAPTER VII.

MELINUM PLINII,
Pliny's Earth of Milo.

WE have thought it necessary to add the Name of the Author who distinguishes this Earth by that of the Place from which it used to be brought; because there is in this Case another Instance of what we have too often

often already had Occasion to remark, that different Authors have called very different Substances by the same Name, only because they happened to be brought from the same Place. The *Melian* Earth of this Author being a Marl, and very different from the *Melinum* or *Terra Melia* of *Theophrastus* and *Dioscorides*, which was of the Tripela Kind, though it happened to be brought from the same Island of *Milo*, or as the Ancients called it *Melos*.

The Marl called *Melinum* by *Pliny* and those who have followed his Accounts, is an Earth of a very close, even and compact Texture, yet by no Means hard or firm, like the Earths of the same Sort of Texture among the Bole and Clay Kinds. It is of a smooth but not glossy Surface, and breaks equally readily in any Direction. It is soft to the Touch, and breaks easily between the Fingers, and if the small Fragments of it are rubbed between them, they easily crumble into a most fine and impalpable Powder. It is not very heavy, though so close in its Structure; it has nothing of the laminated or plated Structure of the *Chian* and some other medicinal Marls, and in Colour is of an extremely clean and fine white. If applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it freely and readily melts in it, and leaves not the least Grittiness between the Teeth.

If thrown into Water it makes a considerable hissing Noise, and sends up many Bubbles to the Surface, and after a few Moments moulders away to a fine white Powder; if calcined in a common Fire it retains its Whiteness, and becomes much harder than before, and if put into the strongest Acids, it makes not the least Effervescence with them.

The Ancients found it in great Abundance in the Island whence it has its Name, where it still lies in the same Plenty near the Surface. The Authors of several Ages recommend it internally in Fevers, and used it mixed with Vinegar externally in Luxations and Strains. The ancientest Use of it seems however to have been in Painting, in which it made one of the three or four Colours first used, and always kept its Credit as vastly superior to all the other white Earths for the same Purpose.

If its Particles be carefully separated by Water, there is found beside the mere earthy Matter, some pure Snow white Talk distributed among the Mass in Form of a most fine and subtle Powder.

C H A P T E R VIII.

C R E T A, *Chalk.*

THIS is one of the Earths which among the Ancients obtained its Name from the Place whence it was usually sent, to the Places where the Authors of those Times resided. This Place was the Island of *Crete*, and accordingly it was called by them *Cretica Terra*, and thence by a Corruption of Spelling and Pronunciation *Creta*.

We are not to suppose that so common an Earth as this was peculiar to that Island only, in that Part of the World; but if the best and purest was found there, or if only Custom had established an Opinion that this was the Case, it was enough to make every Body wish to have it thence; and call it by
Way

Way of Distinction from that of other Places by this Name. We have the Names of many of their Earths applied at present to other Substances than they meant by them, but that is not the Case in regard to this Fossil; the Chalk of *Crete* was the same with the Chalk of *England*.

It is the hardest and firmest of all the Earths of this Class; it is of the Number of those which break with equal Ease in any Direction, and which are rough to the Touch, have dusty Surfaces, and stain the Hands in touching them. It is heavier than almost any other of the medicinal Marls, and in its general State is the purest of any. None of them ferments so briskly with Acids, none of them so readily calcines in the Fire, and none is so long in disuniting in Water. We have observed of what is called another Species of Chalk, the *Stenomarga* or *Seleneusian* Earth of the Ancients, that under various Circumstances it is found extremely different in its Degree of Hardness, and in the Compactness of its Texture. The same occasional Variety in these Particulars we find in Chalk, which if examined in the several Parts of the World, nay only in the several Parts of this Kingdom, which contains at least as much of it as *Crete* of old, it will be found in all the Degrees of Hardness, from such as will crumble on the lightest Touch, to what is as hard as absolute Stone. In all these several States however it shews itself to be true Chalk, by answering in the same Manner to the same Tests in all. The finest that we are acquainted with is that about *Northfleet* near *Gravesend*, and when it is intended for medicinal Use, it is the Custom to chuse that fine Part of it which has filled the Shells of the *Echini Marini*, which are found fossil in those Pits in great Number, and are thence called by the Vulgar *Chalk Eggs*.

The Ancients used Chalk in the same Intention with their other absorbent and alkaline Earths, but they esteemed it less valuable than the *Chian* and some of the others which they used in the same Intention. We differ from them in this, and esteem it, with great Reason, in many Cases where an alkaline Absorbent of the Earth Kind is required, superior to all those whose Scarcity or sounding Names have recommended them in the middle Ages. We are acquainted with nothing that is a more ready Cure for the Heart-burn and other Complaints, which arise from a too great Acidity of the Juices of the Stomach. And it has been given by many in Catarrhs, where an acrid and sharp Rheum is troublesome, with good Effect. We have had Accounts of Cures performed by long repeated Use of Chalk in Cases of Worms, and in Hæmorrhages not over violent, but subject to frequent Returns; there has been great good done by it. When Milk, whether Asses or that of the Cow are proper, but are subject to be curdled by the too great Acidity of the stomachic Juice, Chalk is as good as all the testaceous Powders in the World to remedy that Inconvenience; and finally in most Cases, where Pearls and Coral are expected to do Service, this cheap, and therefore despised Medicine, will do more.

In Cases of the Heart-burn it is best swallowed dry in Powder mixed with Sugar; on other Occasions it may be given in almost any Form; but for whatever Purpose in Medicine it is intended, it ought to be reduced to as fine a Powder by levigating, as the other absorbent Powders are. Its Dose is from four or five Grains to a Dram.

In Diarrhœas a Decoction of Chalk made in the Manner of the common Hartshorn Drink is a much better Medicine; if a proper Quantity of *Gum A-*

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rabie be added to this Decoction, it gives a Thickness and Tenacity to the Liquor, which makes it support a great Part of the finer Particles of the Chalk and appear milky, and when sweetened is a very pleasant as well as a very efficacious Medicine.

CHAPTER IX.

M A R G A,

Marl.

BESIDE the Number of Earths truly of the Marl Kind, to which Authors of ancient as well as later Times have given various Names, from the Places whence they are, or have been brought, and from other Accidents, there is one Species known in the *German* Shops under the simple Name of *Marga*, or *Marla*, and which has a Place in the Catalogues of the *Materia Medica* under the same Name; but according to the different Accidents of Colour under which the Authors who described it had chanced to see it, with the additional Epithet of *alba* or *incarnata*, white or flesh coloured.

The Earth is the same under either of these Appearances, and equally answers to all its Characteristics under both. It is an Earth of a very even, compact and close Texture, and of a smooth and somewhat glossy Surface. It is soft and unctuous to the Touch, and does not stain the Hands unless rubbed very hard between them; though very compact in Appearance, it has so little Firmness in the Mass that it is easily broken, and when a small Piece of it is rubbed between the Fingers, very readily moulders into a fine impalpable Powder. It is met with in Masses from an Ounce to a Pound or more in Weight, and when broken appears very regular and uniform in its Construction, not plated or laminated as many of the Marls are. In Colour it is naturally of a dead white, but it very frequently acquires a red Tinge, and in different Pieces has this in all the several Degrees from the palest Flesh Colour to that of Blood.

Applied to the Tongue it adheres somewhat firmly to it; and if taken into the Mouth it melts slowly into a fine, soft, unctuous Matter, leaving not the least Grittiness between the Teeth. The Characters that distinguish it from the other Marls are, that if calcined in a moderate Fire it becomes much harder and of a dusky brownish Colour; if put into the strongest Acids it does not raise the least Effervescence with them; and if thrown into Water it sends up some Air Bubbles with a slight hissing Noise, and after a few Moments swells in Bulk, and soon after falls into a whitish or reddish Powder. It is never found in regular Strata, but always in Fissures of Beds of Stone, which it frequently fills quite up, and will be formed afresh after they have been emptied, being of the Number of those Substances which, like the *Stalactites* and other Incrustations of Caverns, are formed to this Day, wherever Water or Vapours loaded with them have Time to stagnate and deposit them. It is found in the Quarries of *France*, *Italy*, and *Germany*. The Mines of *Coselsaer* and those of *Sneberg* give frequent Opportunities of finding it, and in the last the Miners shew a Fissure, which they say has been emptied and filled again many Times within their Memory.

It is esteemed an Astringent, and given as such in Diarrhoeas, Dysenteries and

and Hæmorrhages; the red Kind is preferred for the last Intention, but the Difference between this and the white is not worth regarding. The *Germans* give it also in Fevers, in Convulsions, and particularly in epileptic Cases, and in internal Bruises, but we are apt to believe too many Virtues are ascribed to it.

C H A P T E R X.

RUBRICA FABRILIS.

Reddle.

THIS is an Earth which retains its Place in all the Catalogues of the *Materia Medica*, and which from its Use in Colouring, has generally been ranked among the Ochres, but it is truly a Species of Marl. It is of a tolerably close and even Texture, yet of very little Hardness: its Surface is naturally smooth and somewhat glossy, and it is soft and unctuous to the Touch, but stains the Fingers very much on touching it.

It is very easily broken between the Hands, and is of the Number of those Marls which are not laminated, and therefore breaks with Ease in any Direction. It is remarkably heavy, and in Colour of a fine florid, tho' not very deep red. Applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it melts very freely in it, but is of a disagreeable and nauseous Taste, and is not pure, but always leaves a Sensation of Grittiness between the Teeth.

If its Parts be disunited by Water, and the Sediment after shaking be carefully examined, there will be found three very different Matters contained in it; the first Sediment is a small one, of a white and not very fine Sand, this is what gives the Sensation of Roughness between the Teeth; after this there subsides a small Quantity of the same Kind of glossy and soft Matter, that is separated from the brown *Samian* Earth, that is of Fragments of the common plated *Selenites*; and after these the Earth itself settles, and it may in this Manner be separated from all its extraneous Particles by repeated Washing. It makes not the least Ebullition or Effervescence with Acids, if calcined in a common Fire it becomes considerably harder than before, but retains the same Colour. If a Piece of it be put into Water, it almost immediately breaks at the Surface, and in a few Moments moulders away to a fine Powder.

It is a very common Earth in many Parts of the World: Our *American* Colonies abound with it, the *German* Mines afford it in great Plenty, and in *England* we have the finest in the World, in vast Quantities in many Places, but particularly in *Derbyshire*. Its Taste plainly proves it to be an Astringent, and as such it has been used by many People, and a Cataplasm made up with the Powder of this Earth and Vinegar has been often applied with Success to Strains and Laxations of the Joints. We do not hear of its Name in Prescription, nor in the Shops of our Druggists, but we meet with the Substance itself there too frequently. It is sometimes used to give the Colour of Bole Armenic to common Pipe Clay, in order to its being sold under that Name, and sometimes is mixed in very small Quantity with the common Whiting washed to a Fineness, till it brings it up to the Colour of levigated red Corall, then the Matter is dropped upon a Chalk Stone, and dry'd to be sold under that Name: this is a Cheat so easily discovered by the Taste, that one would

wonder any Man could have the Hardiness to attempt it, but we have met with it in more Shops than one.

CHAPTER XI.

TERRA SAPONARIA QUÆ CIMOLIA PURPURASCENS OFFICINARUM,
Fuller's Earth called Cimolia purpurascens.

THIS is an Earth very sufficiently known in the World, but which has been long known in the Shops under a very wrong Name. The Ancients seem not to have known it at all; but as People have been willing to adapt all their Names to something, they have found that the Earth they called *Cimolia purpurascens* was used about Cloaths and without any farther Ceremony have given it to the Earth that is principally used for the same Purposes with us, tho' it have not the least Resemblance of the Earth they have described to us in any Particular. We have already observed that the Earth which they called *Cimolia purpurascens* was the same with our *Steatites* or Soap-Rock described among the indurated Clays.

Our Fuller's Earth is a Marl of a close Texture, and of a tolerably smooth and glossy Surface when it has been a little rubbed. It is extremely soft and unctuous to the Touch. It is not so shattery or friable as many of the Marls, but in the firmer Pieces requires a smart Blow to break it. Its Colour is a greyish brown with some Admixture of the Olive or greenish among it. It has this Tinge in all Degrees, as well as its general Colour, some of it being met with very green, other Pieces with scarce any Greenness in them; and some very pale, others almost black. Applied to the Tongue it adheres slightly to it, and if taken into the Mouth it melts slowly and gradually in it, and fills it with an Unctuousity and a disagreeable Taste, generally leaving also some harsh Particles that grit between the Teeth. If calcined in a common Fire it becomes very hard and of a pale reddish Colour; if thrown into the strongest Acids it raises no Effervescence with them, and if put in Water it makes no hissing, nor sends up any Bubbles, but gradually swells in Bulk, and falls into a fine and soft Powder.

The finest Fuller's Earth in the World is dug in our own Island, and all the Nations about us would be glad to purchase it at a great Price, were the Exportation of it allowed; but one of the great Advantages of our woollen Manufacture is the keeping it at Home. It is frequent in *Bedfordshire* near *Wooburn*, where the greatest Quantity is dug; there are also Pits of it in *Surry*, and in some other Counties, and Strata in many Places where it would be very well worth the Proprietors while to have it dug, tho' at present it is neglected.

Its great Use in taking Grease out of woollen Cloaths is sufficiently known. The medicinal Virtues that give it a Place in Catalogues of the *Materia Medica* are those of an Absorbent and Astringent, but these we have so many other Things so much preferable for, that it is scarce ever heard of, except that the good Women sometimes use it externally to prevent Excoriations in Infants.

Of OCHRES.

THE Earths distinguished by the Name of Ochres, are those which have rough or naturally dusty Surfaces, are but slightly coherent in their Texture, and are composed of fine and soft argillaceous Particles, and are readily diffusible in Water.

The Earths of this Kind that have been used in Medicine, and therefore make a Part of the *Materia Medica*, are only three. 1. The *Ochra Attica* of *Dioscorides*, a yellow one. 2. The Ochre called by the Ancients *Rubrica Sinopica*, or red Earth of *Sinope*, a deep red one; and 3. That Species of Ochre called by the Ancients *Cæruleum*, and by many, tho' very improperly, *Lapis Armenus*.

CHAPTER I.

OCHRA,
Yellow Ochre.

AUTHORS who have written on these Subjects have generally described our common yellow Ochre as the Earth to which the Ancients, beside the using it in Painting, ascribed some Virtues as a Medicine, but this is erroneous. The Earth they used under that Name is described by *Dioscorides* under the Name of *Ochra Attica*, and proves to be very different from our common Kind, tho' this Species is also found among us.

It is an elegant and beautiful Earth, of a soft, shattery and friable Texture, and naturally of a tolerably even, tho' dusty Surface. It is usually met with in flat Pieces, and tho' very easily broke in any Direction, yet when the Masses have any considerable Thickness it separates more readily into flat Cakes in a Direction that was its horizontal one while it lay in the Earth, than any other way: this is owing to its Structure which is not uniform as that of the Generality of the Earths, but laminated or composed of a great Number of very thin and fine Plates which lye evenly over one another, but do not cohere very closely.

It is very light, and in Colour is of a very bright and strong yellow, sometimes purely and uniformly so, but at others variegated with Clouds of a deeper yellow approaching to the Orange Colour, and in some Specimens, tho' that is very rare, with a fair tho' not very bright red. Applied to the Tongue it adheres very firmly to it; if taken into the Mouth it breaks very readily in it, and has a disagreeable Taste, but is so fine and pure, that it leaves not the least Grittiness between the Teeth.

If calcined in a moderate Fire it becomes of a strong, but not very bright red, and acquires a little additional Hardness; if put into the strongest Acids it does not cause the least Ebullition in them, and if thrown into Water it sends up a large Quantity of Air Bubbles with a hissing Noise, but does not break till after some time in it, when it gradually separates first into a great Number of thin Flakes, and from these falls into a fine yellow Powder.

This

This Species of Ochre seems to have been known both among the Painters and in Medicine from the very earliest Times, and is so extremely different from our common yellow Ochre, that it is very absurd to attribute to that Earth the Qualities we find the old Writers giving to this.

It is very rarely found in Strata, in the Manner of the Generality of the Earths; its general Situation is in the perpendicular Fissures of the Strata of Stone, and it is sometimes found in loose Masses of two or three Ounces Weight among the Pebbles, in our Gravel Pits. We have it in this last State in many Places to the North of *London*, and the Masses picked up there, if compared with the Description *Dioscorides* has left us of the *Grecian* Kind, which he says was very light, of a fine yellow composed of a Number of thin Plates or Flakes, and not containing any stony or gritty Particles, will be found to agree so perfectly with all the Particulars of it, that there is no room to doubt of its being the very same Substance. Beside its Use in Painting, it was esteemed a very valuable external Medicine in Inflammations and Tumors; they mixed it with various Liquids, and usually applied it in Form of a Cataplasm.

On Analysis this is found to contain Iron, and that in such Quantity as could scarce be conceived from its Lightness; what Weight it has seems indeed to be almost entirely owing to the ferrugineous Matter it contains.

CHAPTER II.

RUBRICA SINOPICA, *Earth of Sinope.*

THE Ancients have not been so careful in distinguishing the Characteristics of the Genera of the several Earths they admitted into Medicine as might have been wished, and it is owing to their Inaccuracy that we find in this Instance a true Ochre called by the Name of a Reddle, or *Rubrica*, that is of a Kind of Marl, for the Name *Rubrica Sinopica* is no more than a literal Translation of the Name, by which *Theophrastus* and all the other *Greeks* whose Works are preserved to us have called it. It is truly a Species of Ochre, and is the only one of the red Kind which they admitted into Use as a Medicine.

It is by far the most dense and compact in its Texture of all this Genus of Fossils; it is met with in Masses of two or three Ounces, and sometimes more in Weight, but never in very large ones; these are of an even, but not smooth or glossy Surface, and are soft to the Touch, but usually have some dusty Matter about them, and very deeply stain the Hands on touching them. They are not of the plated Structure of the former Ochre, but even and uniform in the whole Mass, and break with equal Ease and Readiness in any Direction, tho' they are so hard that it requires a smart Blow to break them at all.

This is as much the heaviest as the most compact of all the Ochres. It is usually of a fine glowing Purple or deep red Colour, but in some Pieces much paler, nay even in some of no more than a Flesh Colour, yet always bright and beautiful, and under all these Appearances giving the same Proofs of its being the genuine Substance under the severest Trials. Applied to the Tongue it adheres very firmly to it, and if taken into the Mouth it very readily dis-unites in it, leaving a very remarkable astringent Taste behind it, but having

no hard Particles in it, nor making the least gritting between the Teeth. If a Piece of it be thrown into Water it sends up a great Quantity of Air Bubbles with a loud hissing Noise, and after a few Moments swells in Bulk, and by Degrees moulders away to a fine Purple Powder. Thrown into any acid *Mensstruum* it makes a very considerable Effervescence, and on calcining in a moderate Fire it acquires a very considerable Addition to its Hardness, but its Colour remains unaltered.

This Earth has been in Use from the earliest Times we have any Account of.

In the Times of *Theophrastus* and *Dioscorides* it was dug in *Cappadocia* and in no other Part of the World, its Name of *Sinopica* having been given it not from its being produced near that City, but from that's being the Place where it was most frequently sold; afterwards it was found also in *Ægypt* and *Africa*, and in the *Insulæ Baleares* or *Majorca* and *Minorca*, in the latter of which it is found also at this Day: It does not constitute whole Strata in the Earth, but is found in the perpendicular Fissures of the Beds of Stone, particularly in the Rocks about Iron Mines. We have it not, so far as is yet known, in *England*, but it is sometimes met with in our *American* Colonies, particularly in the *New Jersey*, and is there from its Colour called *Bloodstone*. It is an excellent Astringent, the Ancients have been very full of its Praises in Diarrhoeas and Dysenteries, and indeed in Hæmorrhages of all Kinds, and I have the Proof of a frequent Use of it to affirm from, that it does in reality possess all the Virtues they ascribe to it; it is indeed equal to any of the astringent Earths we are acquainted with, superior to most.

On Analysis it is found to contain a very considerable Quantity of Iron. I have procured near one fifth of that Metal from the finest Specimens of it.

CHAPTER III.

LAPIS ARMENUS, *Armenian Stone.*

NOTHING has perplexed the World more in their Enquiries into the Substances used in Medicine than the improper Names they have been call'd by, and we have in no Case a greater Instance of this Confusion and Error than in regard to this Fossil.

The *Armenium* or *Cæruleum Nativum* of the Ancients is in Reality, according to their own Accounts, if we examine those who wrote first of it, and who were best acquainted with it, no other than a kind of Earth: It is properly an Ochre of Copper, as the yellow Earths we usually distinguish by this general Name are Ochres of Iron; but the Inaccuracy of some of the Writers who succeeded these, having judged the Word *Lapis* applicable enough to any thing that was dug out of the Ground, having added it to the more simple Name of this Substance, and call'd it, instead of *Armenium*, *Lapis Armenus*; People who have, after their Time, attempted to determine what was the Substance meant by the Descriptions of the Ancients, and have contented themselves with going as far back as to these instead of going to the Fountain Head among the *Greeks*, have look'd for a blue Stone to answer the Description they have met with of the *Armenium*, and finding it was used as a Colour in Painting, have supposed it

it must be of the *Lapis Lazuli* Kind; and have generally understood it to be a Stone like that in all Respects, except that it had not its gold-like Spangles: Nay some have allowed it even these too, and have left us scarce any Distinction between the two Substances, though in Reality they are at least as different as an *Egyptian* Pebble and a Lump of Clay. People who write on Subjects that the Ancients have treated of are fond of calling in their Names on every Occasion, and of quoting their Sentiments as far as they will fall in with their Purposes; but if we examine their Quotations, we shall find that they generally think it going very far back if they go to *Pliny*, and they take his Accounts for those of the Ancients in general: But this is not going nearly far enough, *Pliny* often indeed gives us Translations of *Dioscorides* and *Theophrastus* for the Accounts of Things, but then he often translates them very ill, and not unfrequently omits a Part of what they have said, or adds from others, whose Writings are lost to us, Errors or Contradictions: We have a Proof of this in the Instance before us. *Pliny* adds the Word *Lapis* to the *Ceruleum* or *Armenium* of the Authors whom he translates from, and blunders so far in the Translation itself, as to say that such of it as is greenest is the best; whereas the Accounts of those from whom he intended to take his, all declare its great Value to be in its pure and unmixed blue Colour.

We are sorry to have Occasion to name so great an Author as *Geoffroy* among those who have err'd about the *Lapis Armenus* as it is call'd, but we ought not to contradict him without giving our Reasons for it: He describes this Substance as an opaque Stone, spotted with Green, Blue and Black, and with the same Sort of gold-like Spangles that the *Lapis Lazuli* has, from which Stone he says it differs very little, nay that both are sometimes found in the same Mass and are often used for one another. This Description agrees but very ill with the Substance we preserve as the true *Ceruleum* or *Lapis Armenus* (if we must follow a bad Custom so far as to call it so) of the Ancients, which is indeed a true Ochre. But as this Substance perfectly agrees with the Accounts of the earliest Writers among the *Greeks* who always describe it as a blue Earth, and particularly with that of *Dioscorides*, who tells us it was a blue, soft and friable Substance, smooth and of an even and regular Texture, we shall not hesitate to give its Description for that of the true *Lapis Armenus*, though we could not think it proper to put a poor Earth in this manner in the Place of a fine and beautiful Stone without this prefatory Apology.

The blue Ochre of the Shops, call'd very improperly *Lapis Armenus*, is a soft and friable Earth, of an extremely even and regular Texture where it is pure, but often debased by a Mixture of foreign Particles. We meet with it in Masses of two or three Ounces Weight, which are of an irregular Figure, but generally of a tolerably even and smooth Surface, easily broken between the Fingers, and in small Pieces crumbling into an impalpable Powder on rubbing a little between them. It is smooth to the Touch though not unctuous as the finer Boles are: It is lighter than most of the other Earths, and in Colour is of a very beautiful Blue, sometimes deeper and sometimes paler, though very bright and elegant in all its Degrees, and often spotted with a greenish, sometimes with a blackish Earth, and sometimes, though more rarely, containing in it a Quantity of that fine green arenaceous Matter which the Ancients knew under the Name of *Chrysocolle*: All these Admixtures however debase the true
Nature

Nature of this valuable Earth, whose most perfect State is that in which it is only Blue, it does not stain the Hands in touching it: Apply'd to the Tongue it adheres very firmly to it, and if taken into the Mouth it is of a very disagreeable Taste, but is so perfectly fine as to leave not the least Grittiness between the Teeth.

The finest *Lapis Armenus* is that which is of the deepest blue Colour, the most soft to the Touch, and most easily crumbled to Powder between the Fingers; that which is lightest, and which has fewest green or black Particles mix'd with it; these being no Part of the *Armenus* itself, but really Pieces of a green Ochre, or of a black Earth of the same Kind that have accidentally got in among it. The Tests to prove that it is genuine are these: If kept a few Moments red hot in a common Fire it loses all its blue Colour, and when cold is found to be a mere brown Ochre a little harder than it was before. If put into the strongest acid Menstruums it makes not the least Effervescence with them; and if thrown into Water it immediately sends up a Number of Air Bubbles with a hissing Noise, and after a few Moments swells in Bulk, and gradually breaks into small Lumps and thence into a fine blue Powder.

The Ancients had it from *Ægypt* and many Parts of the East. At present it is not only produced in the same Places but in many others, though no where in any great Plenty. We have it in some Parts of *Ireland*; in the Neighbourhood of *Truro* where there is Copper-Oar; and the Mines of *Germany* and *Saxony*, where the same Metal is found, frequently afford it. It is never found in whole Strata, but only in small Lumps lodged in the Fissures of Rocks, where the common green Ochre used in Painting, and call'd by the *Germans* *Berggrüen*, is also found Native, and is frequently mix'd with it. It has been a Custom lately to call this green Ochre *Chrysocola*, but the *Chrysocola* which the Ancients mention to have been sometimes found in their *Lapis Armenus* or *Ceruleum Nativum*, was not this but the green Sand before mentioned. The Specimen I am so happy to possess with a Quantity of this in it, came from *Persia* with some of the *Turquoises* of that Country.

The *Lapis Armenus* is one of the finest Blues that Nature furnishes for Painting, and in Oil makes a Colour that will stand without Alteration, almost as well as the true *Ultramarine*. It has also been used in Medicine, but never obtained any great Credit that way. It is a violent Emetic, and generally begins to work almost as soon as it is swallowed. The Dose is from five to ten or twelve Grains, and the Miners who know its Effects, though not its Name, sometimes take it in Disorders of the Head and Stomach.

On Analysis it is found to contain a considerable Quantity of Copper. It is too scarce among us to make many Experiments upon, but I have produced from a rich Piece of it one eighth of its Weight in pure Copper.

OF TRIPELA'S.

THE Earths of this Genus are distinguished by their having rough and dusty Surfaces, and by their being naturally dry, and composed of harsh Particles.